

2012 Mississippi Curriculum Framework

Postsecondary Information Systems Technology

(Computer Networking Technology: Program CIP: 11.0901 – Computer Systems Networking and Telecommunications)

(Computer Programming Technology: Program CIP: 11.0201 – Computer Programming/Programmer, General)

(Database Administration Technology: Program CIP: 11.0802 – Data Modeling/Warehousing and Database Administration)

(Network Security Technology: Program CIP: 11.1003 – Computer and Information Systems Security)

Direct inquiries to

LaNell Kellum, PhD
 Director for Career and Technical Education
 Mississippi Community College Board
 3825 Ridgewood Road
 Jackson, MS 39211
 601.432.6518
lkellum@mccb.edu

Myra Pannell
 Instructional Design Specialist
 Research and Curriculum Unit
 P.O. Drawer DX
 Mississippi State, MS 39762
 662.325.2510
myra.pannell@rcu.msstate.edu

Published by

Office of Career and Technical Education
 Mississippi Department of Education
 Jackson, MS 39205

Research and Curriculum Unit
 Mississippi State University
 Mississippi State, MS 39762

The Mississippi Department of Education, Office of Career and Technical Education does not discriminate on the basis of race, color, religion, national origin, sex, age, or disability in the provision of educational programs and services or employment opportunities and benefits. The following office has been designated to handle inquiries and complaints regarding the non-discrimination policies of the Mississippi Department of Education: Director, Office of Human Resources, Mississippi Department of Education, 359 North West Street, Suite 203, Jackson, Mississippi 39201, 601.359.3511.

Table of Contents

Acknowledgments.....	5
Foreword.....	10
Program Description.....	14
Suggested Course Sequence for Career Certificate Option.....	16
Suggested Course Sequence for Technical Certificate Option.....	17
Suggested Course Sequence for Associate Degree Option.....	18
Suggested Course Sequence for Career Certificate Option.....	23
Suggested Course Sequence for Technical Certificate Option.....	24
Suggested Course Sequence for Associate Degree Option.....	25
Suggested Course Sequence for Career Certificate Option.....	30
Suggested Course Sequence for Technical Certificate Option.....	31
Suggested Course Sequence for Associate Degree Option.....	32
Suggested Course Sequence for Career Certificate Option.....	36
Suggested Course Sequence for Technical Certificate Option.....	37
Suggested Course Sequence for Associate Degree Option.....	38
Information Systems Technology Core Courses.....	42
IT Foundations.....	42
Operating Platforms.....	44
System Maintenance.....	45
Fundamentals of Data Communications.....	47
Principles of Information Security.....	49
Web and Programming Concepts.....	51
Web Development Concepts.....	54
Programming Development Concepts.....	56
Concepts of Database Design.....	58
IST Seminar I.....	59
IST Seminar II.....	60
IST Seminar III.....	61
IST Seminar IV.....	62
Computer Networking Technology Courses.....	63
Client Installation and Configuration.....	63
Network Components.....	65
Network Administration Using Novell.....	66
Network Administration Using Microsoft Windows Server.....	68
Network Administration Using Linux.....	70
Network Security.....	72
Network Planning and Design.....	74
Network Implementation.....	76
Advanced Network Administration Using Novell.....	77
Advanced Network Administration Using Microsoft Windows Server.....	79
Advanced Network Administration Using Linux.....	81
Computer Programming Technology Courses.....	83
Visual BASIC Programming Language.....	83
Survey of Microcomputer Applications.....	85

RPG Programming Language	87
COBOL Programming Language	89
Fundamentals of Virtualization.....	90
Java Programming Language.....	92
Systems Analysis and Design	93
Script Programming Language	95
Advanced Visual BASIC Programming Language	97
Database Programming and Design.....	99
Advanced RPG Programming Language.....	100
Advanced COBOL Programming Language	101
C Programming Language	102
Advanced C Programming Language	103
Career Development	105
Client-Side Programming	106
Web Design Applications	108
Web Site and Systems Development	109
XML Programming.....	110
Server-side Programming I.....	112
Server-side Programming II.....	113
Mobile Application Development.....	115
E-commerce Strategies	117
Web Server.....	119
Database Administration Technology Courses.....	121
SQL Programming.....	121
Advanced SQL Programming.....	123
Database Architecture and Administration.....	125
Advanced Database Architecture and Administration.....	127
Linux Operating System Fundamentals.....	128
IT Project Management.....	129
Principles of Database Management.....	130
Network Security Technology Courses	131
Computer Forensics	131
Network Security Fundamentals.....	132
Wireless Security and Privacy	134
Network Defense and Countermeasures.....	136
Windows Security	138
Linux/Unix Security.....	140
Security Testing and Implementation	142
Baseline, Service, and Related Courses.....	144
Fundamentals of Information Technology.....	144
Fundamentals of Microcomputer Applications	147
Supervised Work Experience in Information Systems Technology	148
Special Problem in Information Systems Technology.....	149
Work-Based Learning I, II, III, IV, V, and VI.....	150
Appendix A: Course References.....	151

Appendix A: National Workforce Center for Emerging Technologies Skill Standards for Information Technology	176
Appendix B: Related Academic Standards	189
Appendix C: 21 st Century Skills	195

Acknowledgments

IST Core Development Team	Angela Bryan, Mississippi Gulf Coast Community College Joann Cooper, Hinds Community College Thomas Fortenberry, East Central Community College Robin Hayes, Mississippi Gulf Coast Community College Paul Hollomon, Jones County Junior College Brenda Johnson, East Central Community College Nick Newell, Northeast Mississippi Community College Mark Nichols, Northeast Mississippi Community College J. David Rose, Hinds Community College
Computer Networking Writing Team	Kelly Cluff, East Central Community College Paul Hollomon, Jones County Junior College Thomas Fortenberry, East Central Community College Cindy Layman, Itawamba Community College J. David Rose, Hinds Community College
Computer Programming Writing Team	Stella Dickerson, East Central Community College Paul Hollomon, Jones County Junior College Brenda Johnson, East Central Community College Nick Newell, Northeast Mississippi Community College Mark Nichols, Northeast Mississippi Community College Jo Ponder, Hinds Community College
Database Administration Technology Writing Team	Robin Hayes, Mississippi Gulf Coast Community College
Network Security Technology Writing Team	Angela Bryan, Mississippi Gulf Coast Community College Brian Burrous, Mississippi Gulf Coast Community College J. David Rose, Hinds Community College
RCU Staff	Myra Pannell, Instructional Design Specialist Scott Kolle, Postsecondary Project Manager Heather Wainwright, Editor
Professional Curriculum Advisory Team	Hinds Community College Networking Advisory Team East Mississippi Community College Networking Advisory Team Jones County Junior College Networking Advisory Team Holmes Community College Networking Advisory Team Mississippi Delta Community College Networking Advisory Team Hinds Community College Programming Advisory Committee Holmes Community College Programming Advisory Committee Jones County Junior College Programming Advisory Committee

Pearl River Community College Programming Advisory Committee
 Jones Junior College Web Development Technology Advisory Committee
 Copleah-Lincoln Community College Web Development Advisory Committee
 Jason Hébert, Systems Analyst, Northrop Grumman Ship Systems, Pascagoula, MS
 Mississippi Gulf Coast Community College Database Development Technology Advisory Team
 Leo Lawson, Jr. MAJ USAF, 333 Training Wing, Keesler AFB, MS
 Gene Bogart, Senior Security Analyst, WareOnEarth Communications, Inc., Stennis Space Center, MS
 Jamie Flowers, Applications Programmer and Network Administrator, Planning Systems, Inc., Stennis Space Center, MS
 Jeffrey Scott, Information Security Officer, WareOnEarth Communications, Inc., Stennis Space Center, MS

Standards in this document are based on information from the following organizations:

- | | |
|---|--|
| Skill Standards for Information Technology | National Workforce Center for Emerging Technologies (NWCET) (2003). <i>Skill standards for information technology</i> . Bellevue, WA: Bellevue Community College. Copyright 2003 by the National Workforce Center for Emerging Technologies. All rights reserved. |
| Related Academic Standards | CTB/McGraw-Hill LLC. (2005). <i>Tests of adult basic education, Forms 9 and 10</i> . Monterey, CA: Author. Reproduced with permission of CTB/McGraw-Hill LLC. TABE is a registered trademark of The McGraw-Hill Companies, Inc. Copyright 2005 by CTB/McGraw-Hill LLC. Reproduction of this material is permitted for educational purposes only. |
| 21st Century Skills | Reproduced with permission of the Partnership for 21st Century Skills. Further information may be found at www.21stcenturyskills.org . |

Preface

Information Systems Technology Research Synopsis

Articles, books, Web sites, and other materials listed at the end of each course were considered during the revision process. CompTIA A+ Essentials and A+ 220-602 examination objectives were especially useful in providing insight into field-related trends and issues. These references are suggested for use by instructors and students during the study of the topics outlined.

Industry advisory team members and instructors from colleges throughout the state were asked to provide input to inform changes to the curriculum framework. Commentators highlighted specific soft skills as critical objectives of this program, including the need for students to demonstrate professionalism and ethics as well as effective communication and customer service skills in the workplace. Recommendations also emphasized the need to teach Internet ethics, to incorporate virtualization and “app” programming courses, to address software licensing issues, and to encourage industry certifications. In addition, it was suggested that the core IST courses be maintained but separated into four concentrations.

Needs of the Future Workforce

Description	2010 Jobs	2019 Jobs	% Change	2011 Median Hourly Wage	National 2010	National 2019	National % Change
Computer and information scientists, research	350	411	17%	\$35.52	30,554	35,024	15%
Computer programmers	1,538	1,597	4%	\$19.05	433,107	417,284	(4%)
Computer systems analysts	1,630	1,934	19%	\$22.10	598,778	681,123	14%
Database administrators	387	458	18%	\$20.85	112,500	129,224	15%
Network and computer systems administrators	1,670	2,020	21%	\$22.46	354,153	416,042	17%
Network systems and data communications analysts	1,169	1,514	30%	\$16.79	392,371	510,639	30%
Computer specialists, all other	703	766	9%	\$29.18	226,059	242,694	7%
Total	7,447	8,700	17%	\$21.91	2,147,521	2,432,029	13%

Source: Outlook Report, Economic Marketing Specialists, Inc., 2011

Curriculum

The following national standards were referenced in each course of the curriculum:

- CTB/McGraw-Hill LLC *Tests of Adult Basic Education, Forms 9 and 10 Academic Standards*
- *21st Century Skills*
- *Skill Standards for Information Technology*

The curriculum revision team considered industry and instructor comments, along with current research, during the revision process, and changes were made as needed and appropriate. Many of the skills and topics noted in the research were already included in the curriculum framework. At the online revision meeting on October 3, 2011, the following changes to the curriculum were approved:

- Competencies and objectives were reviewed and adjusted to ensure accuracy and appropriateness.
- IST 1483 Fundamentals of Virtualization was added as a Computer Programming elective.
- IST 1173 Principles of Database Management was added as a Database Administration elective.
- IST 2454 Mobile Application Development was added as a Computer Programming elective.
- IST 1811 IST Seminar I was added as an Information Systems Technology elective.
- IST 1821 IST Seminar II was added as an Information Systems Technology elective.
- IST 2111 IST Seminar III was added as an Information Systems Technology elective.
- IST 2121 IST Seminar IV was added as an Information Systems Technology elective.
- Course outlines for relevant career and technical certificates as well as for the associate of applied science (AAS) degree were updated.
- The title of Security Principles and Policies was changed to Principles of Information Security.
- References were updated.

Assessment

Students will be assessed using the *Information Systems Technology MS-CPAS2 Assessment* as well as the corresponding tests with each concentration, unless an alternative assessment is approved. Several colleges are piloting national certifications in addition to the MS-CPAS2.

Students are assessed using the MS-CPAS2 test. The MS-CPAS2 blueprint can be found at <http://www.rcu.msstate.edu/>.

- a. A student's technical skill attainment for completion of the Career Certificate will be assessed utilizing the MSCPAS Career Certificate (Y1) assessment score.
- b. A student's technical skill attainment for the Technical Certificate and/or the Associate of Applied Science degree will be assessed utilizing the student's MSCPAS Career Certificate (Y1) assessment and MSCPAS Technical Certificate (Y2) assessment.
- c. Timing of Y1 and Y2 Assessments:
 - a. A student may complete the Y1 assessment upon application for the Career Certificate.
 - b. A student may complete the Y2 assessment upon application for the Technical Certificate or the Associate of Applied Science Degree (scores for the Y1 and Y2 assessments are averaged.)
 - c. A student may complete both the Y1 and the Y2 assessment upon application for the Technical Certificate or the Associate of Applied Science Degree (scores for the Y1 and Y2 assessments are averaged).

If there are questions regarding assessment of this program, please contact the Instructional Design Specialist at the Research and Curriculum Unit at 662.325.2510.

Professional Learning

It is suggested that instructors participate in professional learning related to the following concepts:

- How to use the Blackboard program site
- Differentiated instruction – To learn more about differentiated instruction, please go to http://www.paec.org/teacher2teacher/additional_subjects.html, and then click on Differentiated Instruction. Work through this online course and review the additional resources.
- 21st Century Skills – To learn more about 21st Century Skills, please visit their Web site, <http://www.p21.org/>, and then click on Overview – 21st Skills Framework.
- Related Academics – To learn more about Related Academics, please go to CTB/McGraw Hill Web site (<http://www.ctb.com/ctb.com/control/main?p=home>); to review the most updated standards for the Tests of Adult Basic Education, click on the TABE logo under the Featured Products tab on the CTB/McGraw Hill home page.

It is suggested that instructors participate in professional learning related to instruction of the following Career Technical Core courses:

- IT Foundations
- Fundamentals of Data Communications
- Principles of Information Security
- Web and Programming Concepts
- Concepts of Database Design

Program Exceptions

No program exceptions exist at this time.

Articulation

No articulated credit will be offered upon implementation of this curriculum by the college.

Foreword

As the world economy continues to evolve, businesses and industries must adopt new practices and processes in order to survive. Quality and cost control, work teams and participatory management, and an infusion of technology are transforming the way people work and do business. Employees are now expected to read, write, and communicate effectively; think creatively, solve problems, and make decisions; and interact with each other and the technologies in the workplace. Career–technical programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world.

The curriculum framework in this document reflects these changes in the workplace and a number of other factors that impact local career–technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and career skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U.S. Department of Education and Labor, provide career and technical educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document.

Referenced throughout the courses of the curriculum are the 21st Century Skills, which were developed by the Partnership for 21st Century Skills, a group of business and education organizations concerned about the gap between the knowledge and skills learned in school and those needed in communities and the workplace. A portion of the 21st Century Skills addresses learning skills needed in the 21st century, including information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. Another important aspect of learning and working in the 21st century involves technology skills. The International Society for Technology in Education, developer of the National Educational Technology Standards (NETS), was a strategic partner in the Partnership for 21st Century Skills.

Each postsecondary program of instruction consists of a program description and a suggested sequence of courses that focus on the development of occupational competencies. The MS-CPAS2 blueprints are based upon the suggested course sequences to allow for Career Certificate (Y1) and Technical Certificate (Y2) assessments for all exit options. Please refer to the blueprint online. Each career–technical course in this sequence has been written using a common format, which includes the following components:

- Course Name – A common name that will be used by all community and junior colleges in reporting students
- Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students

- Classification – Courses may be classified as the following:
 - Career–technical core – A required career–technical course for all students
 - Area of concentration (AOC) core – A course required in an area of concentration of a cluster of programs
 - Career–technical elective – An elective career–technical course
 - Related academic course – An academic course that provides academic skills and knowledge directly related to the program area
 - Academic core – An academic course that is required as part of the requirements for an associate’s degree
- Description – A short narrative that includes the major purpose(s) of the course and the recommended number of hours of lecture and laboratory activities to be conducted each week during a regular semester
- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course
- Corequisites – A listing of courses that may be taken while enrolled in the course
- Competencies and Suggested Objectives – A listing of the competencies (major concepts and performances) and the suggested student objectives that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
 - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
 - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised

- Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs
- Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas
- Sequencing of the course within a program is left to the discretion of the local district. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The following 2012 SACS standard applies.

- *Section 2.7.3 For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics.*

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives to complement the existing competencies and suggested objectives in the program framework.
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

In addition, the curriculum framework as a whole may be customized by doing the following:

- Sequencing courses within the suggested course sequence reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district (with MCCB approval)

- Adding courses listed in the “Approved Career and Technical Electives List” as local certificate and degree completion requirements to meet specific needs of industries and other clients in the community. The “Approved Career and Technical Electives” are currently approved in the Uniform Course Numbering Book; therefore, MCCB approval is not required.

Program Description

The Information Systems Technology program includes a basic core of courses designed to prepare a student for a variety of entry-level positions through selection of a concentration of courses in the following areas:

- Computer Networking Technology
- Computer Programming Technology
- Database Administration Technology
- Network Security Technology

The curriculum is designed to give each student:

- a broad overview of information systems;
- exposure to career options available within the field; and
- a concentration of skills in a specific area.

Upon successful completion of the program, graduates earn an associate degree in applied science. Students who successfully complete the program should have the skills required for obtaining CompTIA A+® Certification or other certifications as skills allow. Industry standards referenced are from the National Workforce Center for Emerging Technologies Skill Standards for Information Technology.

Technical skill attainment for students completing any of the Career Certificate options within the Information System Technology Curriculum Cluster may be assessed using the Information Systems Technology Y1 MSCPAS2 assessment. However, a college may utilize an approved alternative assessment (e.g. Comptia* A+ Certifications 220-701 and 220-702) to assess technical skills attainment for students completing any of the Career Certificate options.

The Computer Networking Technology option offers training in telecommunications, network technologies, administration, maintenance, operating systems and network planning, and implementation. Computer Networking graduates will have opportunities for employment as computer support specialists, network technicians, and network managers or administrators.

The Computer Programming Technology option offers training in the design of coding and testing of applications using a variety of programming languages, database manipulation, hardware maintenance, and operating system functions. Opportunities for graduates with expertise in computer programming include employment as computer consultants or in corporations in the fields of health care, manufacturing, and telecommunications.

The Database Administration Technology option is designed to prepare students for entry-level employment in the database administration field. Students will set up, administer, and maintain small- and large-scale relational database systems and will prepare for certification exams in database administration.

The Network Security Technology option offers training in the areas of confidentiality, integrity, and availability in information security. Students will learn to install, design, manage, operate, plan, and troubleshoot a secure information technology infrastructure.

Suggested Course Sequence Computer Programming Technology

Career Certificate Option

A Career Certificate will be awarded upon completion of the required courses for the Career Certificate option in Computer Programming Technology.

*IST 1124 (or CPT 1333 and CNT 2423/CPT 2383)	IT Foundations (or Operating Platforms and Systems Maintenance)	4 sch: 2-hr lecture, 4-hr lab
*IST 1143	Principles of Information Security	3 sch: 2-hr lecture, 2-hr lab
*IST 1134	Fundamentals of Data Communications	4 sch: 2-hr lecture, 4-hr lab
*IST 1154	Web and Programming Concepts	4 sch: 2-hr lecture, 4-hr lab
*IST 1163	Concepts of Database Design	3 sch: 2-hr lecture, 2-hr lab
	Programming Electives	6 sch
	Approved Career Technical Electives	6 sch
	Total Semester Credit Hours for a Career Certificate	30 sch

MSCPAS2 test will be administered upon completion of the above courses.

***These course competencies will be assessed in the MSCPAS2 Y1 Test.** However, a college may utilize an approved alternative assessment (e.g. Comptia* A+ Certifications 220-701 and 220-702) to assess these course competencies.

Students who lack entry level skills in math, English, science, etc. will be provided related studies.

Suggested Course Sequence Computer Programming Technology

Technical Certificate Option*

A Technical Certificate will be awarded upon completion of all required Career Certificate courses **AND** the following required Technical Certificate courses in the Computer Programming Technology program.

	Career Certificate	30 sch
IST 2314	Systems Analysis and Design	4 sch: 2-hr lecture, 4-hr lab
	Programming Electives	8 sch
	Approved Career Technical Electives	3 sch
	Total Semester Credit Hours for a Technical Certificate	45 sch

***The nature of this program does not allow for a Y2, MSCPAS Technical Certificate test. Since all participating colleges teach different programming languages, the requirements involve primarily programming electives based on the relevant programming language for the college.** A college may utilize an approved alternative assessment (e.g. CIW Certification Partners “Site Development Associate) to assess these course competencies.

Suggested Course Sequence Computer Programming Technology

Associate of Applied Science Degree Option

To receive the Associate of Applied Science Degree in Computer Programming Technology, a student must complete all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The following 2012 SACS standard applies.

Section 2.7.3 For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics.

A student must complete the following minimum credit requirements for the AAS Degree Option:

Career Certificate	30 credits minimum
Technical Certificate	+15 credits minimum
General Education Core Courses	+15 credits minimum
Total Semester Credit Hours for the Associate of Applied Science Degree	60 credits minimum hours earned as a compilation of Career, Technical, and Academic credit hours.

Approved Career–Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives to complement the existing competencies and suggested objectives in the program framework.
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour **(after informing the Mississippi Community College Board [MCCB] of the change)**

In addition, the curriculum framework as a whole may be customized by doing the following:

- Sequencing courses within the suggested course sequence to reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district **(with MCCB approval)**
- Adding courses listed in the “Approved Career and Technical Electives List” as local certificate and degree completion requirements to meet specific needs of industries and other clients in the community. The “Approved Career and Technical Electives” are currently approved in the Uniform Course Numbering Book; therefore, MCCB approval is **not** required.

APPROVED ELECTIVES FOR
COMPUTER PROGRAMMING TECHNOLOGY

Programming Electives		
IST 1314	Visual Basic Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1324	RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1334	COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1414	Client-side Programming	4 sch: 2-hr lecture, 4-hr lab
IST 1424	Web Design Applications	4 sch: 2 hr. lecture, 4 hr. lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1714	Java Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2324	Script Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2334	Advanced Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2344	Database Programming and Design	4 sch: 2 hr. lecture, 4 hr. lab
IST 2354	Advanced RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2364	Advanced COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2374	C Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2384	Advanced C Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2424	XML Programming	4 sch: 2-hr lecture, 4-hr lab
IST 2434	Server-side Programming I	4 sch: 2 hr. lecture, 4 hr. lab
IST 2444	Server-side Programming II	4 sch: 2 hr. lecture, 4 hr. lab
IST 2454	Mobile Application Development	4 sch: 2 hr lecture, 4 hr lab
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Approved Career Technical Electives		
BOT 1213	Professional Development	3 sch: See Appropriate Program Description
BOT 2323	Database Management	3 sch: See Appropriate Program Description
BOT 2813	Business Communication	3 sch: See Appropriate Program Description
CPT 1113	Fundamentals of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 1323	Survey of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 2133	Career Development	3 sch: 2-hr lecture, 2-hr lab
CPT 2354	Web Site and Systems Development	
IST 1113	Fundamentals of Information Technology	3 sch: 2-hr lecture, 2-hr lab
IST 1173	Principles of Database Management	3 sch: 2-hr lecture, 2-hr lab
IST 1213	Client Installation and Configuration	3 sch: 2-hr lecture, 2-hr lab
IST 1234	Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab

IST 1244	Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 1254	Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 1314	Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1324	RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1334	COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1414	Client-side Programming	4 sch: 2-hr lecture, 4-hr lab
IST 1424	Web Design Applications	4 sch: 2 hr. lecture, 4 hr. lab
IST 1483	Fundamentals of Virtualization	3 sch: 2-hr lecture, 2-hr lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1613	Computer Forensics	3 sch: 2-hr lecture, 2-hr lab
IST 1714	Java Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2213	Network Security	3 sch: 2-hr lecture, 2-hr lab
IST 2244	Advanced Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 2254	Advanced Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 2264	Advanced Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 2314	Systems Analysis and Design	4 sch: 2-hr lecture, 4-hr lab
IST 2324	Script Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2334	Advanced Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2344	Database Programming and Design	4 sch: 2 hr. lecture, 4 hr. lab
IST 2354	Advanced RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2364	Advanced COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2374	C Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2384	Advanced C Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2424	XML Programming	4 sch: 2-hr lecture, 4-hr lab
IST 2434	Server-side Programming I	4 sch: 2 hr. lecture, 4 hr. lab
IST 2444	Server-side Programming II	4 sch: 2 hr. lecture, 4 hr. lab
IST 2454	Mobile Application Development	4 sch: 2 hr lecture, 4 hr lab
IST 2473	E-commerce Strategies	3 sch: 2-hr lecture, 2-hr lab
IST 2483	Web Server	3 sch: 2-hr lecture, 2-hr lab
IST 2534	IT Project Management	4 sch: 2-hr lecture, 4-hr lab
IST 2623	Linux/Unix Security	3 sch: 2-hr lecture, 2-hr lab
IST 2634	Security Testing and Implementation	4 sch: 2-hr lecture, 4-hr lab
IST 1811	IST Seminar I	1 sch: 1-hr lecture
IST 1821	IST Seminar II	1 sch: 1-hr lecture
IST 2111	IST Seminar III	1 sch: 1-hr lecture
IST 2121	IST Seminar IV	1 sch: 1-hr lecture
IST 291(1-6)	Supervised Work Experience in Information Systems Technology	1-6 sch: 3-18 hr. externship
IST 292(1-3)	Special Problem in Information Systems	1-3 sch: 2-6 hr. lab

	Technology	
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-based Learning I, II, III, IV, V, and VI	1-3 sch: 3-9 hr. externship
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Suggested Course Sequence Computer Networking Technology

Career Certificate Option

A Career Certificate will be awarded upon completion of the required courses for the Career Certificate option in Computer Networking Technology.

*IST 1124 (or CPT 1333 and CNT 2423/CPT 2383)	IT Foundations (or Operating Platforms and Systems Maintenance)	4 sch: 2-hr lecture, 4-hr lab
*IST 1143	Principles of Information Security	3 sch: 2-hr lecture, 2-hr lab
*IST 1134	Fundamentals of Data Communications	4 sch: 2-hr lecture, 4-hr lab
*IST 1154	Web and Programming Concepts	4 sch: 2-hr lecture, 4-hr lab
*IST 1163	Concepts of Database Design	3 sch: 2-hr lecture, 2-hr lab
IST 1223	Network Components	3 sch: 2-hr lecture, 2-hr lab
	Networking Electives	6 sch
	Approved Career Technical Electives	3 sch
	Total Semester Credit Hours for a Career Certificate	30 sch

MSCPAS2 test will be administered upon completion of the above courses.

***These course competencies will be assessed in the MSCPAS2 Y1 Test.** However, a college may utilize an approved alternative assessment (e.g. *Comptia A+ Certifications 220-701 and 220-702) to assess these course competencies.

Students who lack entry level skills in math, English, science, etc. will be provided related studies.

Suggested Course Sequence Computer Networking Technology

Technical Certificate Option

A Technical Certificate will be awarded upon completion of all required Career Certificate courses **AND** the following required Technical Certificate courses in the Computer Networking Technology program.

	Career Certificate	30 sch
*IST 2224	Network Planning and Design	4 sch: 2-hr lecture, 4-hr lab
*IST 2234	Network Implementation	4 sch: 2-hr lecture, 4-hr lab
	Programming Elective	3 sch
	Approved Career Technical Electives	4 sch
	Total Semester Credit Hours for a Technical Certificate	45 sch

The MSCPAS2 test will be administered upon completion of the above courses.

***These course competencies will be assessed in the MSCPAS2 Y2 test.** However, a college may utilize an approved alternative assessment (e.g. Comptia* Network+ Certification) to assess these course competencies.

Suggested Course Sequence Computer Networking Technology

Associate of Applied Science Degree Option

To receive the Associate of Applied Science Degree in Computer Networking Technology, a student must complete all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The following 2012 SACS standard applies.

Section 2.7.3 For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics.

A student must complete the following minimum credit requirements for the AAS Degree Option:

Career Certificate	30 credits minimum
Technical Certificate	+15 credits minimum
General Education Core Courses	+15 credits minimum
Total Semester Credit Hours for the Associate of Applied Science Degree	60 credits minimum hours earned as a compilation of Career, Technical, and Academic credit hours.

Approved Career–Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives to complement the existing competencies and suggested objectives in the program framework.
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour **(after informing the Mississippi Community College Board [MCCB] of the change)**

In addition, the curriculum framework as a whole may be customized by doing the following:

- Sequencing courses within the suggested course sequence to reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district **(with MCCB approval)**
- Adding courses listed in the “Approved Career and Technical Electives List” as local certificate and degree completion requirements to meet specific needs of industries and other clients in the community. The “Approved Career and Technical Electives” are currently approved in the Uniform Course Numbering Book; therefore, MCCB approval is **not** required.

APPROVED ELECTIVES FOR COMPUTER NETWORKING TECHNOLOGY

Networking Electives		
IST 1213	Client Installation and Configuration	3 sch: 2-hr lecture, 2-hr lab
IST 1234	Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 1244	Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 1254	Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 2244	Advanced Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 2254	Advanced Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 2264	Advanced Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Programming Electives		
IST 1314	Visual Basic Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1324	RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1334	COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1414	Client-side Programming	4 sch: 2-hr lecture, 4-hr lab
IST 1424	Web Design Applications	4 sch: 2 hr. lecture, 4 hr. lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1714	Java Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2324	Script Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2334	Advanced Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2344	Database Programming and Design	4 sch: 2 hr. lecture, 4 hr. lab
IST 2354	Advanced RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2364	Advanced COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2374	C Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2384	Advanced C Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2424	XML Programming	4 sch: 2-hr lecture, 4-hr lab
IST 2434	Server-side Programming I	4 sch: 2 hr. lecture, 4 hr. lab
IST 2444	Server-side Programming II	4 sch: 2 hr. lecture, 4 hr. lab
IST 2454	Mobile Application Development	4 sch: 2 hr lecture, 4 hr lab
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Approved Career Technical Electives		
BOT 1213	Professional Development	3 sch: See Appropriate Program Description
BOT 2323	Database Management	3 sch: See Appropriate Program Description
BOT 2813	Business Communication	3 sch: See Appropriate Program Description
CPT 1113	Fundamentals of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 1323	Survey of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 2133	Career Development	3 sch: 2-hr lecture, 2-hr lab
CPT 2354	Web Site and Systems Development	
IST 1113	Fundamentals of Information Technology	3 sch: 2-hr lecture, 2-hr lab
IST 1173	Principles of Database Management	3 sch: 2-hr lecture, 2-hr lab
IST 1213	Client Installation and Configuration	3 sch: 2-hr lecture, 2-hr lab
IST 1234	Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 1244	Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 1254	Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 1314	Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1324	RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1334	COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1414	Client-side Programming	4 sch: 2-hr lecture, 4-hr lab
IST 1424	Web Design Applications	4 sch: 2 hr. lecture, 4 hr. lab
IST 1483	Fundamentals of Virtualization	3 sch: 2-hr lecture, 2-hr lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1613	Computer Forensics	3 sch: 2-hr lecture, 2-hr lab
IST 1714	Java Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2213	Network Security	3 sch: 2-hr lecture, 2-hr lab
IST 2244	Advanced Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 2254	Advanced Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 2264	Advanced Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 2314	Systems Analysis and Design	4 sch: 2-hr lecture, 4-hr lab
IST 2324	Script Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2334	Advanced Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2344	Database Programming and Design	4 sch: 2 hr. lecture, 4 hr. lab
IST 2354	Advanced RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2364	Advanced COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2374	C Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2384	Advanced C Programming Language	4 sch: 2-hr lecture, 4-hr lab

IST 2424	XML Programming	4 sch: 2-hr lecture, 4-hr lab
IST 2434	Server-side Programming I	4 sch: 2 hr. lecture, 4 hr. lab
IST 2444	Server-side Programming II	4 sch: 2 hr. lecture, 4 hr. lab
IST 2454	Mobile Application Development	4 sch: 2 hr lecture, 4 hr lab
IST 2473	E-commerce Strategies	3 sch: 2-hr lecture, 2-hr lab
IST 2483	Web Server	3 sch: 2-hr lecture, 2-hr lab
IST 2534	IT Project Management	4 sch: 2-hr lecture, 4-hr lab
IST 2623	Linux/Unix Security	3 sch: 2-hr lecture, 2-hr lab
IST 2634	Security Testing and Implementation	4 sch: 2-hr lecture, 4-hr lab
IST 1811	IST Seminar I	1 sch: 1-hr lecture
IST 1821	IST Seminar II	1 sch: 1-hr lecture
IST 2111	IST Seminar III	1 sch: 1-hr lecture
IST 2121	IST Seminar IV	1 sch: 1-hr lecture
IST 291(1-6)	Supervised Work Experience in Information Systems Technology	1-6 sch: 3-18 hr. externship
IST 292(1-3)	Special Problem in Information Systems Technology	1-3 sch: 2-6 hr. lab
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-based Learning I, II, III, IV, V, and VI	1-3 sch: 3-9 hr. externship
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Suggested Course Sequence Database Administration Technology

Career Certificate Option

A Career Certificate will be awarded upon completion of the required courses for the Career Certificate option in Database Administration Technology.

*IST 1124 (or CPT 1333 and CNT 2423/CPT 2383)	IT Foundations (or Operating Platforms and Systems Maintenance)	4 sch: 2-hr lecture, 4-hr lab
*IST 1143	Principles of Information Security	3 sch: 2-hr lecture, 2-hr lab
*IST 1134	Fundamentals of Data Communications	4 sch: 2-hr lecture, 4-hr lab
*IST 1154	Web and Programming Concepts	4 sch: 2-hr lecture, 4-hr lab
*IST 1163	Concepts of Database Design	3 sch: 2-hr lecture, 2-hr lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1314	Visual Basic Programming	4 sch: 2-hr lecture, 4-hr lab
	Database Elective	3 sch
	Approved Career Technical Electives	2 sch**
	Total Semester Credit Hours for a Career Certificate	30 sch

MSCPAS2 test will be administered upon completion of the above courses.

***These course competencies will be assessed in the MSCPAS2 Y1 Test.** However, a college may utilize an approved alternative assessment (e.g. *Comptia A+ Certifications 220-701 and 220-702) to assess these course competencies.

****These are the minimum credit hours of approved career-technical electives needed to meet the 45-hour requirement; however, it is understood that there will be cases when students will have a surplus of credit hours because most approved career-technical electives exceed the minimum credit hours required.**

Students who lack entry level skills in math, English, science, etc. will be provided related studies.

Suggested Course Sequence Database Administration Technology

Technical Certificate Option

A Technical Certificate will be awarded upon completion of all required Career Certificate courses **AND** the following required Technical Certificate courses in the Database Administration Technology program.

	Career Certificate	30 sch
*IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
*IST 1534	Database Architecture and Administration	4 sch: 2-hr lecture, 4-hr lab
*IST 2514	Advanced Database Architecture and Administration	4 sch: 2-hr lecture, 4-hr lab
*IST 2524 or IST 1254	Linux Operating System Fundamentals or Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
	Total Semester Credit Hours for a Technical Certificate	45 sch

Currently, all Database Administration Technology programs use approved alternative assessments (e.g. Certification Partners (CIW) “Database Design Specialist”) to assess these course competencies.

Suggested Course Sequence Database Administration Technology

Associate of Applied Science Degree Option

To receive the Associate of Applied Science Degree in Database Administration Technology, a student must complete all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The following 2012 SACS standard applies.

Section 2.7.3 For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics.

A student must complete the following minimum credit requirements for the AAS Degree Option:

Career Certificate	30 credits minimum
Technical Certificate	+15 credits minimum
General Education Core Courses	+15 credits minimum
Total Semester Credit Hours for the Associate of Applied Science Degree	60 credits minimum hours earned as a compilation of Career, Technical, and Academic credit hours.

Approved Career–Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives to complement the existing competencies and suggested objectives in the program framework.
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour **(after informing the Mississippi Community College Board [MCCB] of the change)**

In addition, the curriculum framework as a whole may be customized by doing the following:

- Sequencing courses within the suggested course sequence to reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district **(with MCCB approval)**
- Adding courses listed in the “Approved Career and Technical Electives List” as local certificate and degree completion requirements to meet specific needs of industries and other clients in the community. The “Approved Career and Technical Electives” are currently approved in the Uniform Course Numbering Book; therefore, MCCB approval is **not** required.

APPROVED ELECTIVES FOR
DATABASE ADMINISTRATION TECHNOLOGY

Database Electives		
BOT 2323	Database Management	3 sch: See Appropriate Program Description
IST 1173	Principles of Database Management	3 sch: 2-hr lecture, 2-hr lab
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Approved Career Technical Electives		
BOT 1213	Professional Development	3 sch: See Appropriate Program Description
BOT 2323	Database Management	3 sch: See Appropriate Program Description
BOT 2813	Business Communication	3 sch: See Appropriate Program Description
CPT 1113	Fundamentals of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 1323	Survey of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 2133	Career Development	3 sch: 2-hr lecture, 2-hr lab
CPT 2354	Web Site and Systems Development	
IST 1113	Fundamentals of Information Technology	3 sch: 2-hr lecture, 2-hr lab
IST 1173	Principles of Database Management	3 sch: 2-hr lecture, 2-hr lab
IST 1213	Client Installation and Configuration	3 sch: 2-hr lecture, 2-hr lab
IST 1234	Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 1244	Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 1254	Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 1314	Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1324	RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1334	COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1414	Client-side Programming	4 sch: 2-hr lecture, 4-hr lab
IST 1424	Web Design Applications	4 sch: 2 hr. lecture, 4 hr. lab
IST 1483	Fundamentals of Virtualization	3 sch: 2-hr lecture, 2-hr lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1613	Computer Forensics	3 sch: 2-hr lecture, 2-hr lab
IST 1714	Java Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2213	Network Security	3 sch: 2-hr lecture, 2-hr lab
IST 2244	Advanced Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 2254	Advanced Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab

IST 2264	Advanced Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 2314	Systems Analysis and Design	4 sch: 2-hr lecture, 4-hr lab
IST 2324	Script Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2334	Advanced Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2344	Database Programming and Design	4 sch: 2 hr. lecture, 4 hr. lab
IST 2354	Advanced RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2364	Advanced COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2374	C Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2384	Advanced C Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2424	XML Programming	4 sch: 2-hr lecture, 4-hr lab
IST 2434	Server-side Programming I	4 sch: 2 hr. lecture, 4 hr. lab
IST 2444	Server-side Programming II	4 sch: 2 hr. lecture, 4 hr. lab
IST 2454	Mobile Application Development	4 sch: 2 hr lecture, 4 hr lab
IST 2473	E-commerce Strategies	3 sch: 2-hr lecture, 2-hr lab
IST 2483	Web Server	3 sch: 2-hr lecture, 2-hr lab
IST 2534	IT Project Management	4 sch: 2-hr lecture, 4-hr lab
IST 2623	Linux/Unix Security	3 sch: 2-hr lecture, 2-hr lab
IST 2634	Security Testing and Implementation	4 sch: 2-hr lecture, 4-hr lab
IST 1811	IST Seminar I	1 sch: 1-hr lecture
IST 1821	IST Seminar II	1 sch: 1-hr lecture
IST 2111	IST Seminar III	1 sch: 1-hr lecture
IST 2121	IST Seminar IV	1 sch: 1-hr lecture
IST 291(1-6)	Supervised Work Experience in Information Systems Technology	1-6 sch: 3-18 hr. externship
IST 292(1-3)	Special Problem in Information Systems Technology	1-3 sch: 2-6 hr. lab
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-based Learning I, II, III, IV, V, and VI	1-3 sch: 3-9 hr. externship
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Suggested Course Sequence Network Security Technology

Career Certificate Option

A Career Certificate will be awarded upon completion of the required courses for the Career Certificate option in Network Security Technology.

*IST 1124 (or CPT 1333 and CNT 2423/CPT 2383)	IT Foundations (or Operating Platforms and Systems Maintenance)	4 sch: 2-hr lecture, 4-hr lab
*IST 1143	Principles of Information Security	3 sch: 2-hr lecture, 2-hr lab
*IST 1134	Fundamentals of Data Communications	4 sch: 2-hr lecture, 4-hr lab
*IST 1154	Web and Programming Concepts	4 sch: 2-hr lecture, 4-hr lab
*IST 1163	Concepts of Database Design	3 sch: 2-hr lecture, 2-hr lab
IST 1223	Network Components	3 sch: 2-hr lecture, 2-hr lab
IST 1244	Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 1624	Network Security Fundamentals	4 sch: 2-hr lecture, 4-hr lab
	Approved Career Technical Electives	1 sch**
	Total Semester Credit Hours for a Career Certificate	30 sch

MSCPAS2 test will be administered upon completion of the above courses.

***These course competencies will be assessed in the MSCPAS2 Y1 Test.** However, a college may utilize an approved alternative assessment (e.g. *Comptia A+ Certifications 220-701 and 220-702) to assess these course competencies.

****These are the minimum credit hours of approved career-technical electives needed to meet the 45-hour requirement; however, it is understood that there will be cases when students will have a surplus of credit hours because most approved career-technical electives exceed the minimum credit hours required.**

Students who lack entry level skills in math, English, science, etc. will be provided related studies.

Suggested Course Sequence Network Security Technology

Technical Certificate Option

A Technical Certificate will be awarded upon completion of all required Career Certificate courses **AND** the following required Technical Certificate courses in the Network Security Technology program.

	Career Certificate	30 sch
*IST 1633	Wireless Security and Privacy	3 sch: 2-hr lecture, 2-hr lab
*IST 1643	Network Defense and Countermeasures	3 sch: 2-hr lecture, 2-hr lab
*IST 2613	Windows Security	3 sch: 2-hr lecture, 2-hr lab
	Approved Security Electives	3 sch
	Approved Career Technical Electives	3 sch
	Total Semester Credit Hours for a Technical Certificate	45 sch

The MSCPAS2 test will be administered upon completion of the above courses.

***These course competencies will be assessed in the MSCPAS2 Y2 test.** However, a college may utilize an approved alternative assessment (e.g. Compia* Security+) to assess these course competencies.

Suggested Course Sequence Network Security Technology

Associate of Applied Science Degree Option

To receive the Associate of Applied Science Degree in Network Security Technology, a student must complete all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The following 2012 SACS standard applies.

Section 2.7.3 For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics.

A student must complete the following minimum credit requirements for the AAS Degree Option:

Career Certificate	30 credits minimum
Technical Certificate	+15 credits minimum
General Education Core Courses	+15 credits minimum
Total Semester Credit Hours for the Associate of Applied Science Degree	60 credits minimum hours earned as a compilation of Career, Technical, and Academic credit hours.

Approved Career–Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives to complement the existing competencies and suggested objectives in the program framework.
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour **(after informing the Mississippi Community College Board [MCCB] of the change)**

In addition, the curriculum framework as a whole may be customized by doing the following:

- Sequencing courses within the suggested course sequence to reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district **(with MCCB approval)**
- Adding courses listed in the “Approved Career and Technical Electives List” as local certificate and degree completion requirements to meet specific needs of industries and other clients in the community. The “Approved Career and Technical Electives” are currently approved in the Uniform Course Numbering Book; therefore, MCCB approval is **not** required.

APPROVED ELECTIVES FOR NETWORK SECURITY TECHNOLOGY

Security Electives		
IST 1613	Computer Forensics	3 sch: 2-hr lecture, 2-hr lab
IST 2213	Network Security	3 sch: 2-hr lecture, 2-hr lab
IST 2623	Linux/Unix Security	3 sch: 2-hr lecture, 2-hr lab
IST 2634	Security Testing and Implementation	4 sch: 2-hr lecture, 4-hr lab
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Approved Career Technical Electives		
BOT 1213	Professional Development	3 sch: See Appropriate Program Description
BOT 2323	Database Management	3 sch: See Appropriate Program Description
BOT 2813	Business Communication	3 sch: See Appropriate Program Description
CPT 1113	Fundamentals of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 1323	Survey of Microcomputer Applications	3 sch: 2-hr lecture, 2-hr lab
CPT 2133	Career Development	3 sch: 2-hr lecture, 2-hr lab
CPT 2354	Web Site and Systems Development	
IST 1113	Fundamentals of Information Technology	3 sch: 2-hr lecture, 2-hr lab
IST 1173	Principles of Database Management	3 sch: 2-hr lecture, 2-hr lab
IST 1213	Client Installation and Configuration	3 sch: 2-hr lecture, 2-hr lab
IST 1234	Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab
IST 1244	Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 1254	Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 1314	Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1324	RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1334	COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 1414	Client-side Programming	4 sch: 2-hr lecture, 4-hr lab
IST 1424	Web Design Applications	4 sch: 2 hr. lecture, 4 hr. lab
IST 1483	Fundamentals of Virtualization	3 sch: 2-hr lecture, 2-hr lab
IST 1513	SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1523	Advanced SQL Programming	3 sch: 2-hr lecture, 2-hr lab
IST 1613	Computer Forensics	3 sch: 2-hr lecture, 2-hr lab
IST 1714	Java Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2213	Network Security	3 sch: 2-hr lecture, 2-hr lab
IST 2244	Advanced Network Administration Using Novell	4 sch: 2-hr lecture, 4-hr lab

IST 2254	Advanced Network Administration Using Microsoft Windows Server	4 sch: 2-hr lecture, 4-hr lab
IST 2264	Advanced Network Administration Using Linux	4 sch: 2-hr lecture, 4-hr lab
IST 2314	Systems Analysis and Design	4 sch: 2-hr lecture, 4-hr lab
IST 2324	Script Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2334	Advanced Visual BASIC Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2344	Database Programming and Design	4 sch: 2 hr. lecture, 4 hr. lab
IST 2354	Advanced RPG Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2364	Advanced COBOL Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2374	C Programming Language	4 sch: 2 hr. lecture, 4 hr. lab
IST 2384	Advanced C Programming Language	4 sch: 2-hr lecture, 4-hr lab
IST 2424	XML Programming	4 sch: 2-hr lecture, 4-hr lab
IST 2434	Server-side Programming I	4 sch: 2 hr. lecture, 4 hr. lab
IST 2444	Server-side Programming II	4 sch: 2 hr. lecture, 4 hr. lab
IST 2454	Mobile Application Development	4 sch: 2 hr lecture, 4 hr lab
IST 2473	E-commerce Strategies	3 sch: 2-hr lecture, 2-hr lab
IST 2483	Web Server	3 sch: 2-hr lecture, 2-hr lab
IST 2534	IT Project Management	4 sch: 2-hr lecture, 4-hr lab
IST 2623	Linux/Unix Security	3 sch: 2-hr lecture, 2-hr lab
IST 2634	Security Testing and Implementation	4 sch: 2-hr lecture, 4-hr lab
IST 291(1-6)	Supervised Work Experience in Information Systems Technology	1-6 sch: 3-18 hr. externship
IST 1811	IST Seminar I	1 sch: 1-hr lecture
IST 1821	IST Seminar II	1 sch: 1-hr lecture
IST 2111	IST Seminar III	1 sch: 1-hr lecture
IST 2121	IST Seminar IV	1 sch: 1-hr lecture
IST 292(1-3)	Special Problem in Information Systems Technology	1-3 sch: 2-6 hr. lab
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-based Learning I, II, III, IV, V, and VI	1-3 sch: 3-9 hr. externship
Other instructor approved electives that are listed in the MCCB approved CTE or Academic Uniform Course Numbering document.		

Information Systems Technology Core Courses

Course Name: IT Foundations

Course Abbreviation: IST 1124

Classification: Career Technical Core

Description: This course covers the diagnosis, troubleshooting, and maintenance of computer components and interpersonal communications for information technology (IT) professionals. Topics include hardware compatibility, system architecture, memory, input devices, video displays, disk drives, modems, printers, safety and environmental issues, communication, and professional behavior (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Install, configure, optimize, and upgrade personal computer components.	DOK2, ND2, ND4
a. Identify the fundamental principles of using personal computers.	
b. Use tools, diagnostic procedures, and troubleshooting techniques.	
2. Install, configure, optimize, and upgrade laptops and portable devices.	DOK2, ND1
a. Identify the fundamental principles of using laptops and portable devices.	
b. Use tools, basic diagnostic procedures, and troubleshooting techniques for laptops and portable devices.	
c. Perform preventive maintenance on laptops and portable devices.	
d. Identify additional types of components.	
3. Install and troubleshoot operating systems.	DOK3, ND3, ND4
a. Identify principles of using operating systems.	
b. Configure, optimize, and upgrade operating systems.	
c. Diagnose and troubleshoot operating systems.	
d. Perform preventive maintenance on operating systems.	
4. Install and troubleshoot printers and scanners.	DOK3, ND3, ND4
a. Install, configure, optimize, and upgrade printers and scanners.	
b. Diagnose and troubleshoot printers and scanners.	
5. Explore network technologies.	DOK2, ND1
a. Install NICS.	
b. Configure wireless connections.	
c. Examine diagnostic tools.	
6. Identify security principles.	DOK1, ND1, ND4
a. Optimize hardware, software, and data security.	
b. Identify security tools, diagnostic procedures, and troubleshooting techniques.	
c. Perform preventive maintenance for computer security.	
7. Apply safety and environmental procedures.	DOK2,
a. Identify potential hazards.	
b. Implement proper safety procedures, including ESD precautions and procedures, a safe	

work environment, and equipment handling. c. Identify proper disposal procedures for batteries, display devices, and chemical solvents and cans.
8. Practice proper communication skills, including listening and tact/discretion, when communicating with customers and colleagues. ^{DOK2} a. Use clear, concise, and direct statements. b. Apply active listening skills by allowing the customer to complete statements. c. Ask pertinent questions. d. Avoid jargon, abbreviations, and acronyms. e. Listen to customers.
9. Use job-related professional behavior including notation of privacy, confidentiality, and respect for the customers and the customers' property. ^{DOK2} a. Maintain a positive attitude and tone of voice. b. Avoid arguing or becoming defensive. c. Do not minimize customers' problems. d. Avoid being judgmental or insulting. e. Avoid distractions. f. Respect customers' property.
10. Research new and emerging technology trends. ^{DOK1, ND1} a. Investigate recent technology developments. b. Identify emerging hardware, operating systems, and applications.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing

Course Name: Operating Platforms

Course Abbreviation: CPT 1333

Classification: Career Technical Core

Description: This course will provide experience in a variety of operating platforms. Emphasis will be placed on support personnel's interaction with platforms in order to assist users in business environments (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Install and troubleshoot operating systems.	DOK3, ND1, ND2, ND3, ND4
a. Identify principles of using operating systems. b. Configure, optimize, and upgrade operating systems. c. Diagnose and troubleshoot operating systems. d. Perform preventive maintenance on operating systems.	
2. Identify security principles.	DOK1, ND1
a. Optimize hardware, software, and data security. b. Identify security tools, diagnostic procedures, and troubleshooting techniques. c. Perform preventive maintenance for computer security.	
3. Research new and emerging technology trends.	DOK1, ND1
a. Investigate recent technology developments. b. Identify emerging hardware, operating systems, and applications.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing

Course Name: Systems Maintenance

Course Abbreviation: CNT 2423/CPT 2383

Classification: Career Technical Core

Description: This course covers the diagnosis, troubleshooting, and maintenance of computer components. Topics include hardware compatibility, system architecture, memory, input devices, video displays, disk drives, modems, and printers (3 sch: 2-hr lecture, 2-hr lab).

Pre/Corequisite: Operating Platforms (CPT 1333)

Competencies and Suggested Objectives	
1. Install, configure, optimize, and upgrade personal computer components.	DOK2, ND1, ND4
a. Identify the fundamental principles of using personal computers.	
b. Use tools, diagnostic procedures, and troubleshooting techniques.	
2. Install, configure, optimize, and upgrade laptops and portable devices.	DOK2, ND1, ND2, ND3, ND4
a. Identify the fundamental principles of using laptops and portable devices.	
b. Use tools, basic diagnostic procedures, and troubleshooting techniques for laptops and portable devices.	
c. Perform preventive maintenance on laptops and portable devices.	
d. Identify additional types of components.	
3. Install and troubleshoot printers and scanners.	DOK3, ND1, ND4
a. Install, configure, optimize, and upgrade printers and scanners.	
b. Diagnose and troubleshoot printers and scanners.	
4. Explore network technologies.	DOK2, ND1
a. Install NICS.	
b. Configure wireless connections.	
c. Examine diagnostic tools.	
5. Apply safety and environmental procedures.	DOK2
a. Identify potential hazards.	
b. Implement proper safety procedures including ESD precautions and procedures, a safe work environment, and equipment handling.	
c. Identify proper disposal procedures for batteries, display devices, and chemical solvents and cans.	
6. Research new and emerging technology trends.	DOK1, ND1
a. Investigate recent technology developments.	
b. Identify emerging hardware, operating systems, and applications.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

ND1 Perform Analysis

ND2 Design Network

- ND3 Configure and Deploy Network
- ND4 Perform Testing

Course Name: Fundamentals of Data Communications

Course Abbreviation: IST 1134

Classification: Career Technical Core

Description: This course presents basic concepts of Internet protocol (IP) telephony, local area networks, wide area networks, data transmission, and topology methods (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Examine career opportunities.	DOK1
a. Examine available certifications.	
b. Determine career paths.	
2. Discuss computer hardware components.	DOK1, ND1
a. Describe the input, process, output, and storage elements of the information processing cycle, and explain each element.	
b. Describe and discuss the main classifications of computers.	
3. Analyze communications networks.	DOK2, ND1, ND2, ND3
a. Discuss network basics.	
b. Analyze local area networks.	
c. Analyze wide area networks.	
d. Discuss planning, design, and implementation of networks.	
4. Analyze network hardware and media.	DOK2, ND1, ND2
a. Discuss uses of modems.	
b. Describe various communications media.	
c. Examine repeaters, bridges, gateways, routers, hubs, switches, and wireless equipment.	
d. Explain the relationships between internetworking devices.	
e. Describe wireless communication and wireless devices.	
5. Examine the ISO/OSI model.	DOK1, ND1
a. List and explain the seven layers of the OSI model.	
b. Identify the reasons why industry uses a layered network.	
c. Classify the functions of the seven layers of the OSI model.	
d. Analyze and differentiate between end system (ES) and intermediate system (IS).	
e. Demonstrate how data are transmitted over a network.	
6. Investigate physical topologies.	DOK1, ND1, ND2
a. Identify and compare various topologies.	
b. Evaluate the strengths and weaknesses of current network protocols including wireless and satellite-based solutions.	

7. Describe network transport systems. ^{DOK1, ND1}
a. Explore logical topologies. b. Describe data transmission codes and protocols. c. Describe various hand-shaking and flow control techniques. d. Describe simplex and duplex communications.
8. Analyze TCP/IP as they are used in a networking environment. ^{DOK2, ND1}
a. Discuss and describe the properties of the TCP/IP suite. b. Describe frame relay. c. Differentiate among networking standards and protocols; determine which is most appropriate for specific network settings.
9. Apply methods for subnetting and IP binary conversion. ^{DOK2, ND1, ND2, ND3}
a. Define subnetting and binary conversion. b. Solve subnetting and binary conversion methods. c. Describe TCP, IP addressing mechanism, and subnet masking. d. Compare IPv4 and IPv6.
10. Evaluate and recommend methods to troubleshoot wiring. ^{DOK3, ND1, ND2, ND3, ND4}
a. Identify and evaluate twisted pair and fiber-optic cable for local area networks (LANs). b. Create a LAN connection using twisted pair cable. c. Evaluate and recommend twisted pair and fiber-optic cable for specific LAN scenarios.
11. Evaluate trends of network communication. ^{DOK1, ND1}
a. Analyze emerging network applications and their implications for business opportunities. b. Discuss teleconferencing and videoconferencing techniques. c. Evaluate methods for making informed decisions about a cohesive data communications system.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing

Course Name: Principles of Information Security

Course Abbreviation: IST 1143

Classification: Career Technical Core

Description: This course is an introduction to the various technical and administrative aspects of information security and assurance. This course provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents, and designing a consistent, reasonable information security system with appropriate intrusion detection and reporting features (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Define security basics. DOK1, ND1, ND4, ND7	a. Define information security as applied to wired and wireless networks, applications, and operating systems. b. Explain the concept of information security as a process. c. Analyze information security services. d. List security standards and organizations. e. Describe the role of security professionals to the security process and the organizational structure. f. Analyze the importance of ethics in the security field.
2. Discuss security policies. DOK1, ND1, ND4, ND7	a. Identify the assets that need to be protected by a security policy. b. Classify the various types of policies needed by an organization. c. Explain proper development, deployment, and enforcement of security policies. d. Describe the policy review process.
3. Classify security threats and attacks. DOK2, ND1, ND4, ND7	a. Define risk analysis and risk assessment. b. Differentiate the various types of security threats and attacks. c. Classify the security service targeted by a security threat or attack. d. Identify legislation that addresses information security.
4. Discuss the basics of cryptography. DOK1, ND1, ND4, ND7	a. Identify and classify cryptographic algorithms such as symmetric and asymmetric. b. Explain the concepts of public key infrastructure (PKI), digital certificates, and hashing functions. c. Interpret the various trust models. d. Explain key management activities to include creation, distribution, certification, protection, and revocation.
5. Summarize general security concepts. DOK1, ND1, ND4, ND7	a. Define and characterize access control models. b. Determine essential and nonessential services and protocols. c. Describe various security technologies, including the features, strengths, and weaknesses of protocols, virtual private networks VPNs, and firewalls.

- d. Explain techniques involved in operating system hardening.
- e. Describe the use of logging and analysis to security.
- f. Identify and discuss the types of intrusion detection systems.
- g. Convey the value and proper application of vulnerability testing.
- h. Understand how to maintain and perpetuate risk controls.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND4 Perform Testing
- ND7 Perform Security Administration

Course Name: Web and Programming Concepts

Course Abbreviation: IST 1154

Classification: Career Technical Core

Description: This course is an introduction to Web site development and programming logic. Students will gain hands-on experience in the development of computer programs. Upon completion of this course, students will be able to create a Web site. (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Design a Web page using HTML and/or XHTML.	DOK4, WD3, P1, P3, P4
a. Explain Web page creation.	
b. Contrast text editors and GUI editors.	
c. Explain HTML and XHTML.	
(1) Describe HTML, XHTML, and the standards of each.	
(2) Discuss Web browsers and standards.	
(3) Discuss Web page accessibility.	
d. Explain HTML and/or XHTML coding.	
(1) Explain markup tags.	
(2) Discuss and use document structure tags.	
(3) Demonstrate and use paragraph formatting, block-level elements, and text-level elements.	
(4) Describe and code lists.	
(5) Use comments and good coding practices.	
e. Demonstrate graphical elements.	
(1) Explain and use the horizontal rule.	
(2) Discuss images; use them in a Web page.	
(3) Discuss image file formats; explain image optimization.	
(4) Discuss colors and the Web-safe color palette; implement them.	
(5) Explain special characters.	
(6) Use page colors and backgrounds.	
(7) Incorporate fonts into a Web page.	
f. Describe the use of hyperlinks.	
(1) Explain and code hyperlinks.	
(2) Use image and internal links.	
g. Explain the use of tables.	
(1) Demonstrate tables.	
(2) Use table and data alignment options.	
(3) Explain and use column and row spanning.	
h. Discuss forms.	
(1) Describe form uses and form fields.	
(2) Create forms.	

i. Evaluate image techniques. (1) Create image maps. (2) Discuss and use image transparency. (3) Explain interlacing. (4) Demonstrate the use of animated GIF images. j. Explore the use of frames. (1) Discuss and use frameset and frame tags. (2) Explain and use the frameset document. (3) Describe targeting frames with hyperlinks. (4) Discuss borderless frames. k. Demonstrate Web page layout and elements. (1) Demonstrate effective layout. (2) Discuss color and Web design. (3) Explore font usage. (4) Explain Web site usability testing. l. Demonstrate navigation concepts. (1) Explain the elements of navigation design. (2) Demonstrate primary and secondary navigation. (3) Discuss navigation hierarchy. (4) Discuss site structure, uniform resource locators (URLs), and file names. (5) Discuss familiar navigation conventions. m. Research the standards organizations. (1) Explain the Internet governing bodies. (2) Discuss the Internet Society (ISOC) and Internet Architecture Board (IAB). (3) Describe the Internet Research Task Force (IRTF) and Internet Engineering Task Force (IETF). (4) Discuss the World Wide Web Consortium (W3C), Names and Numbers (ICANN), and Requests for Comments (RFCs). n. Demonstrate Web site usability testing.	2. Demonstrate cascading style sheets (CSS). DOK2, WD3, P1, P3 a. Use CSS language to build cascading style sheets. (1) Discuss the history of CSS. (2) Discuss basic CSS components. (3) Discuss CSS rules. (4) Build a basic style sheet. b. Examine basic CSS techniques. (1) Apply selection techniques. (2) Apply effective font usage. (3) Apply the CSS box model. (4) Use color in CSS. c. Apply advanced CSS techniques. (1) Apply tables. (2) Apply lists. (3) Apply positioning elements.
---	---

3. Use program design tools. ^{DOK2, WD3, P1, P3}
a. Demonstrate the use of a flowchart.
b. Develop pseudocode.
c. Generate a hierarchy chart.
4. Discuss structured or modular programming. ^{DOK1, WD3, P1, P3}
a. Explain sequencing.
b. Explain selection.
c. Explain iteration.
5. Describe the philosophy of object-oriented programming. ^{DOK1, WD3, P1, P3}
a. Demonstrate event-driven programming.
b. Explain procedures.
c. Examine classes.
6. Create applications using program development steps. ^{DOK4, WD3, P1, P3, P4}
a. Discuss the steps in the program development life cycle.
b. Design a program.
c. Code a program.
d. Test and debug a program.

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD3 Develop, Deliver, and Manage Content

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P3 Design/Develop Program
- P4 Implement Program

Course Name: Web Development Concepts

Course Abbreviation: WDT 1123

Classification: Career Technical Core

Description: This course is an introduction to the Internet and its uses in the world of business. It includes basic and advanced features of creating Web pages. Upon completion of this course, students will be able to create a personalized home page (3 sch: 2 hr. lecture, 2 hr. lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Design a Web page using HTML.	DOK4, WD3, P1, P3, P4
a. Explain Web page creation.	
b. Contrast text editors and GUI editors.	
c. Explain HTML.	
(1) Describe HTML and HTML standards.	
(2) Discuss Web browsers and standards.	
(3) Discuss Web page accessibility.	
d. Explain HTML coding.	
(1) Explain markup tags.	
(2) Discuss and use document structure tags.	
(3) Demonstrate and use paragraph formatting, block-level elements, and text-level elements.	
(4) Describe and code lists.	
(5) Use comments and good coding practices.	
e. Demonstrate graphical elements.	
(1) Explain and use the horizontal rule.	
(2) Discuss images; use them in a Web page.	
(3) Discuss image file formats; explain image optimization.	
(4) Discuss colors and the Web-safe color palette; implement them.	
(5) Explain special characters.	
(6) Use page colors and backgrounds.	
(7) Incorporate fonts into a Web page.	
f. Describe HTML hyperlinks.	
(1) Explain and code hyperlinks.	
(2) Use image and internal links.	
g. Explain HTML tables.	
(1) Demonstrate tables.	
(2) Use table and data alignment options.	
(3) Explain and use column and row spanning.	
h. Discuss forms.	
(1) Describe form uses and form fields.	
(2) Create forms.	
i. Evaluate HTML image techniques.	

- (1) Create image maps.
- (2) Discuss and use image transparency.
- (3) Explain interlacing.
- (4) Demonstrate the use of animated GIF images.
- j. Explore HTML frames.
 - (1) Discuss and use frameset and frame tags.
 - (2) Explain and use the frameset document.
 - (3) Describe targeting frames with hyperlinks.
 - (4) Discuss borderless frames.
- k. Demonstrate Web page layout and elements.
 - (1) Demonstrate effective layout.
 - (2) Discuss color and Web design.
 - (3) Explore font usage.
 - (4) Explain Web site usability testing.
- l. Demonstrate navigation concepts.
 - (1) Explain the elements of navigation design.
 - (2) Demonstrate primary and secondary navigation.
 - (3) Discuss navigation hierarchy.
 - (4) Discuss site structure, URLs, and file names.
 - (5) Discuss familiar navigation conventions.
- m. Research the standards organizations.
 - (1) Explain the Internet governing bodies.
 - (2) Discuss the Internet Society (ISOC) and Internet Architecture Board (IAB).
 - (3) Describe the Internet Research Task Force (IRTF) and Internet Engineering Task Force (IETF).
 - (4) Discuss the World Wide Web Consortium (W3C), Names and Numbers (ICANN), and Requests for Comments (RFCs).
- n. Demonstrate Web site usability testing.

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD3 Develop, Deliver, and Manage Content

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P3 Design/Develop Program
- P4 Implement Program

Course Name: Programming Development Concepts

Course Abbreviation: CPT 1143

Classification: Career Technical Core

Description: This course is an introduction to programming logic and computer systems. Students will gain hands-on experience in the development of computer programs (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Demonstrate cascading style sheets using CSS language.	DOK2, WD3, P1, P3
a. Use CSS to build cascading style sheets.	
(1) Discuss the history of CSS.	
(2) Discuss basic CSS components.	
(3) Discuss CSS rules.	
(4) Build a basic style sheet.	
b. Examine basic CSS techniques.	
(1) Apply selection techniques.	
(2) Apply effective font usage.	
(3) Apply the CSS box model.	
(4) Use color in CSS.	
c. Apply advanced CSS techniques.	
(1) Apply tables.	
(2) Apply lists.	
(3) Apply positioning elements.	
2. Use program design tools.	DOK2, WD3, P1, P3
a. Demonstrate the use of a flowchart.	
b. Develop pseudocode.	
c. Generate a hierarchy chart.	
3. Discuss structured or modular programming.	DOK1, WD3, P1, P3
a. Explain sequencing.	
b. Explain selection.	
c. Explain iteration.	
4. Describe the philosophy of object-oriented programming.	DOK1, WD3, P1, P3
a. Demonstrate event-driven programming.	
b. Explain procedures.	
c. Examine classes.	
5. Create applications using program development steps.	DOK4, WD3, P1, P3, P4
a. Discuss the steps in the program development life cycle.	
b. Design a program.	
c. Code a program.	
d. Test and debug a program.	

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD3 Develop, Deliver, and Manage Content

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P3 Design/Develop Program
- P4 Implement Program

Course Name: Concepts of Database Design

Course Abbreviation: IST 1163

Classification: Career Technical Core

Description: This course is an introduction to the design and manipulation of relational databases. Emphasis is placed on creation, manipulation, extraction, and display of data from existing databases. QBE and SQL are explored (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Examine database management.	DOK1, P1
a. Describe a database management system DBMS. b. Analyze relationships among data types. c. Compare advantages and disadvantages of database processing.	
2. Create a database using specific criteria.	DOK4, P1, P3
a. Design a database. b. Construct tables. c. Create entities. d. Key field data.	
3. Update table structure and entities.	DOK2, P1, P3
a. Append, modify, and delete entities. b. Modify table structures.	
4. Query a database.	DOK2
a. Create a query to extract information from one table. b. Create a query to extract information from multiple tables. c. Create queries using a variety of criteria. d. Print queries. e. Save queries.	
5. Construct queries using SQL.	DOK2, P1, P3, P4, P5
a. Investigate table creation through SQL. b. Explore capabilities of SELECT command statements. c. Sort rows retrieved. d. Modify tables by appending, updating, and deleting entities.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: IST Seminar I

Course Abbreviation: IST 1811

Classification: Career and Technical Elective

Description: The Information Systems Technology Seminars are designed to prepare students to enter the workplace. Students learn the value of teamwork, cooperation, community involvement, professionalism, and the latest developments in the computer field (1 sch; 1-hr lecture).

Prerequisite:

Competencies and Suggested Objectives
1. Demonstrate proper interaction and cooperation in the modern workplace. a. Demonstrate communication skills by completing projects within a team setting. b. Evaluate new technologies used in the workplace
2. Demonstrate thinking and learning skills. a. Complete basic logical thinking assignments. b. Complete basic creative thinking puzzles and projects.
3. Participate in community events. a. Assist in a class-organized community service project. b. Assist in at least two community service projects.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

Course Name: IST Seminar II

Course Abbreviation: IST 1821

Classification: Career and Technical Elective

Description: The Information Systems Technology Seminars are designed to prepare students to enter the workplace. Students learn the value of teamwork, cooperation, community involvement, professionalism, and the latest developments in the computer field (1 sch; 1-hr lecture).

Prerequisite:

Competencies and Suggested Objectives
1. Demonstrate proper interaction and cooperation in the modern workplace. a. Demonstrate communication skills by leading a team learning project. b. Evaluate new technologies used in the workplace.
2. Demonstrate thinking and learning skills. a. Complete intermediate logical thinking assignments. b. Complete intermediate creative thinking puzzles and projects.
3. Participate in community events. a. Assist in a class-organized community service project. b. Assist in at least two community service projects.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

Course Name: IST Seminar III

Course Abbreviation: IST 2111

Classification: Career and Technical Elective

Description: The Information Systems Technology Seminars are designed to prepare students to enter the workplace. Students learn the value of teamwork, cooperation, community involvement, professionalism, and the latest developments in the computer field (1 sch; 1-hr lecture).

Prerequisite:

Competencies and Suggested Objectives
1. Demonstrate proper interaction and cooperation in the modern workplace - Demonstrate communication skills by leading a class workshop project. - Evaluate new technologies used in the workplace.
2. Demonstrate thinking and learning skills. - Complete advanced logical thinking assignments. - Complete advanced creative thinking puzzles and projects.
3. Participate in community events. - Assist in a class-organized community service project. - Assist in at least two community service projects.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

Course Name: IST Seminar IV

Course Abbreviation: IST 2121

Classification: Career and Technical Elective

Description: The Information Systems Technology Seminars are designed to prepare students to enter the workplace. Students learn the value of teamwork, cooperation, community involvement, professionalism, and the latest developments in the computer field (1 sch; 1-hr lecture).

Prerequisite:

Competencies and Suggested Objectives
1. Demonstrate proper interaction and cooperation in the modern workplace. a. Demonstrate communication skills by developing and leading a team learning project. b. Evaluate new technologies used in the workplace.
2. Demonstrate thinking and learning skills. a. Complete superior logical thinking assignments. b. Complete superior creative thinking puzzles and projects.
3. Participate in community events. a. Assist in a class-organized community service project. b. Assist in at least two community service projects.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

Computer Networking Technology Courses

Course Name: Client Installation and Configuration

Course Abbreviation: IST 1213

Classification: Technical Elective

Description: This course is designed to help the student install, support, and troubleshoot a current client operating system. Emphasis will be placed on common user operations as well as the network administrator's support of the client (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Describe the OS environment.	DOK 2, ND1
a. Discuss differences in client and server editions. b. Describe a stand-alone computer. c. Describe a workgroup computer. d. Describe a domain.	
2. Analyze architecture.	DOK 2, ND1
a. Discuss modularity. b. Discuss object-oriented operating systems. c. Perform operating system updates. d. Distinguish between cooperative multitasking and preemptive multitasking. e. Distinguish between user mode and kernel mode. f. Explain kernel mode (executive services, micro kernel, HAL, and KM drivers). g. Explain memory paging. h. Discuss support applications.	
3. Compare file systems.	DOK 2, ND1, ND2
a. Explain file system technologies. b. Discuss file system allocation. c. Choose the best file system. d. Explain journaling. e. Outline the boot process, and boot files necessary for file systems. f. Modify the boot file.	
4. Use file management techniques.	DOK 2, ND1, ND2, ND3, ND4
a. Manipulate files and folders. b. Explore disk management. c. Identify drive types (basic and dynamic).	
5. Experiment with different installation methods.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6
a. Implement an installation from CD. b. Implement an automated (unattended) installation. c. Distinguish between the installation programs and common command line options. d. Discuss multiboot and dualboot environments. e. Discuss remote installation.	

f. Discuss cloning.	
g. Explore virtual installation.	
6. Use the configuration and troubleshooting tools.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Use the desktop and desktop settings.	
b. Use the control panel and system settings.	
c. Use the administrative tools.	
d. Create a local computer policy.	
7. Support a system.	DOK 3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Manipulate the system configuration and install hardware devices.	
b. Install device drivers and troubleshoot driver issues.	
c. Support peripherals and configure displays, printers, and networking.	
d. Disable and uninstall hardware devices.	
e. Create and discuss hardware profiles.	
8. Apply networking protocols and networking services.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Discuss TCP/IP and the TCP/IP model.	
b. Identify and recognize networking services (DNS, DHCP, WINS).	
c. Apply services and protocols.	
d. Distinguish FTP, TELNET, SMTP, and SNMP.	
e. Discuss wireless as a network model.	
9. Demonstrate user management.	DOK 3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Set up user accounts.	
b. Set up user profiles (user, mandatory, roaming).	
c. Support remote assistance.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Network Components

Course Abbreviation: IST 1223

Classification: AOC Core (Computer Networking and Network Security)

Description: This course presents local area network and wide area network connectivity. It focuses on architectures, topologies, protocols, and transport methods of a network (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: Fundamentals of Data Communications (IST 1134)

Competencies and Suggested Objectives	
1. Review basic network principles.	DOK 1, ND1
a. Examine and analyze capabilities of networks, i.e., LANs, WANs, MANs, and PANs.	
b. List and describe components of networks.	
2. Solve subnetting problems.	DOK 2, ND1, ND2, ND4
a. Explain reasons for subnetting, including security and preservation of address space.	
b. Apply IP subnetting.	
c. Troubleshoot and solve subnetting problems.	
3. Examine the principles and purpose of routing.	DOK 2, ND1, ND2, ND4
a. Examine routers.	
b. Compare routing protocols, i.e., distance-vector and link-state.	
c. Configure routers.	
d. Test connectivity.	
4. Analyze network components.	DOK 2, ND1, ND2, ND4, ND7
a. Research and examine hardware and software analyzers.	
b. Identify support tools and resources.	
c. Determine how to use support tools and resources in troubleshooting basic network problems.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND4 Perform Testing
- ND7 Perform Security Administration

Course Name: Network Administration Using Novell

Course Abbreviation: IST 1234

Classification: Technical Elective

Description: This course focuses on the management of a computer network using the Novell network operating system. Emphasis will be placed on daily administrative tasks performed by a network administrator (4 sch: 2-hr lecture, 4-hr lab)

Prerequisite: None

Competencies and Suggested Objectives	
1. Use eDirectory.	DOK 2, ND1, ND5, ND6
a. Describe the purpose of directory services. b. Identify the types of directory services objects. c. Use utilities to browse the directory tree. d. Formulate directory services names.	
2. Use a network file system.	DOK 2, ND1, ND5, ND6
a. Describe the organization of a network file system. b. Explain the required server volume and directories. c. Use utilities to browse the file system. d. Use utilities to access the file system.	
3. Maintain a directory services tree.	DOK 3, ND1, ND5, ND6
a. Use utilities to manage the directory services tree structure. b. Create, move, rename, and delete container objects. c. Create, move, rename, and delete leaf objects.	
4. Access directories and files on a network.	DOK 2, ND1, ND5, ND6
a. Describe the use of network and search drives. b. Use utilities to create drive mappings. c. Use utilities to create a directory map object. d. Use utilities to work with files and directories. e. Salvage and purge deleted files.	
5. Set up user accounts and login security.	DOK 3, ND1, ND5, ND6, ND7
a. Create new users. b. Describe login security. c. Create user templates, groups, organizational roles, and profiles. d. Assign access restrictions using utilities. e. Discuss the Netware accounting system.	
6. Set up file system security.	DOK 3, ND1, ND5, ND6, ND7
a. Describe file system security. b. List the directory and file trustee assignments and the effect of each. c. Describe the purpose of an inherited rights filter. d. Use utilities to set file and directory access rights. e. Calculate effective rights. f. List directory and file attributes; explain the effect of each.	

g. Use utilities to set file and directory attributes.	
7. Manage directory services security.	DOK 3, ND1, ND5, ND6, ND7
a. Explain object trustees, object rights, and property rights.	
b. Determine effective rights for objects and properties.	
c. Describe the purpose of the inherited rights filter in directory tree security.	
d. List the default directory services object and property rights.	
e. Use utilities to assign the directory services object and property rights.	
8. Establish network printing services.	DOK 3, ND1, ND5, ND6, ND7
a. Discuss network printing connection methods to include local, remote, and direct.	
b. Create print users and operators.	
c. Establish print users and operators.	
d. Manage print jobs.	
e. Discuss customizing print jobs.	
9. Create login scripts.	DOK 3, ND1, ND5, ND6, ND7
a. Discuss the categories of login scripts.	
b. Explore login script commands.	
c. Create, execute, and debug login scripts.	
10. Research trends in new and emerging technologies.	DOK 1, ND1

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Network Administration Using Microsoft Windows Server

Course Abbreviation: IST 1244

Classification: AOC Core (Network Security); Technical Elective

Description: This course focuses on the management of a computer network using the Microsoft Windows Server network operating system. Emphasis will be placed on daily administrative tasks performed by a network administrator (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Discuss administration functions and responsibilities.	DOK 1, ND1
a. Describe Windows interface (Desktop). b. Demonstrate Windows Explorer. c. Discuss the control panel. d. Describe the software architecture.	
2. Apply knowledge of domains.	DOK 2, ND1, ND2, ND3, ND4, ND5
a. Describe the purpose of a domain. b. Compare domains and workgroups. c. Discuss the different trust relationships in domains. d. Configure devices to participate within a domain. e. Outline components of the active directory.	
3. Create user accounts and login security.	DOK 3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Create user accounts. b. Describe login security. c. Assign access restrictions using appropriate server utilities. d. Convert user accounts by copying existing user accounts. e. Create user profiles. f. Add group membership to users.	
4. Create groups.	DOK 3, ND1, ND2, ND3, ND4, ND5, ND6
a. Discuss default groups. b. Create groups. c. Support group accounts using appropriate server utilities. d. Distinguish domain local group types.	
5. Plan file systems.	DOK 4, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Compare and contrast FAT and NTFS file systems. b. Discuss advanced NTFS EFS and compression attributes. c. Compare basic and dynamic drives. d. Assess dynamic drive types. e. Create partitions/volumes using administrative tools/disk management.	
6. Manage files and folders.	DOK 3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Discuss folder structure. b. Name file and folder attribute settings. c. Manipulate file and folder permissions.	

d. Explain permission inheritance.	
e. Create shares and discuss share permissions.	
f. Discuss installation of applications.	
7. Establish network print services.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6
a. Explain print spooling.	
b. Install a logical printer and printer driver.	
c. Create a new printer and share it on the network.	
d. Explain and support the management of printer properties.	
e. Set printer share security.	
f. Use print job management for both local and remote printers.	
g. Discuss printer pooling.	
8. Explore fault tolerance.	DOK 1, ND1
a. Discuss RAID.	
9. Establish a backup and recovery policy.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6
a. Describe the different backup types.	
b. Discuss backup strategies.	
c. Discuss Windows backup utility.	
d. Discuss third party backup software.	
e. Implement a server restoration from backup media.	
f. Plan for server backup and restoration.	
10. Analyze trends in new and emerging technologies.	DOK 1, ND1
a. Research emerging technologies.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Network Administration Using Linux

Course Abbreviation: IST 1254

Classification: Technical Elective

Description: This course focuses on the management of a computer network using the Linux operating system. Emphasis is placed on installation, configuration, implementation, and administrative tasks of a functional server (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Explain Linux and Linux server administration functions and responsibilities.	DOK 1, NDI
a. Discuss open source software and the open source movement. b. Examine the history of the Linux/Unix network operating system. c. Name and contrast the different distributions of Linux. d. Explain the relevant differences between Linux and other operating systems. e. Describe the role of a network administrator.	
2. Install the Linux operating system.	DOK 2, NDI, ND3, ND5, ND6
a. Prepare computer for installation. b. Perform server installation. c. Configure the server by using GUI utilities and by editing the configuration files.	
3. Use the Linux file system.	DOK 2, NDI, ND3, ND5, ND6
a. Investigate the Linux directory structure. b. Relate the Linux file system to Windows file systems. c. Discuss ext3 and ext4 file systems.	
4. Describe the login process.	DOK 2, NDI
a. Discuss username and passwords. b. Discuss the user root. c. Differentiate between local login and remote login using a terminal emulator.	
5. Use the Linux command line interface.	DOK 2, NDI
a. Compare basic Linux commands to Microsoft DOS. b. Use Linux commands to perform basic file and directory maintenance. c. Use Linux shutdown procedure and commands. d. Use the startx command to enter the Linux GUI.	
6. Set up user accounts and group memberships.	DOK 2, NDI, ND3, ND5, ND6
a. Create and modify user accounts. b. Assign access restrictions and permissions using “chmod.” c. Modify group memberships of users with “chown.”	
7. Establish network file and print sharing.	DOK 2, NDI, ND3, ND5, ND6
a. Set file and directory permissions. b. Create shares. c. Install a local printer. d. Install and share a network printer.	
8. Install and implement a Linux Web server.	DOK 3, NDI, ND3, ND5, ND6

- a. Download a third party Web server such as Apache.
- b. Perform Web server installation.
- c. Test Web server operation by posting a Web page and viewing it from a remote computer.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND3 Configure and Deploy Network
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth

Course Name: Network Security

Course Abbreviation: IST 2213

Classification: Network Security Elective; Technical Elective

Description: This course provides an introduction to network and computer security. Topics such as ethics, security policies, legal issues, vulnerability testing tools, firewalls, and operating system hardening will be discussed. Students will receive a deeper understanding of network operations and protocols through traffic capture and protocol analysis (3 sch: 2-hr lecture, 2-hr lab).

Prerequisites: Principles of Information Security (IST 1143) and Network Components (IST 1223)

Competencies and Suggested Objectives	
1. Review the importance of operational and organizational security.	DOK 1, NDI, ND7
a. Analyze the significance of physical security to information security. b. Discuss the security implications of disaster recovery and business continuity. c. Discuss the security relevance of the education and training of end users, executives, and human resources. d. Review various social engineering techniques and effective security strategies to deter successful social engineering attacks. e. Review general security concepts.	
2. Review communication security.	DOK 1, NDI, ND7
a. Characterize the administration of remote access technologies. b. Define and discuss remote access protocols, such as VPN, RADIUS, TACACS, L2TP/PPTP, SSH, and IPSEC. c. Define and discuss e-mail security concepts, technologies, and protocols such as S/MIME, PGP, SPAM, SMTP Relay, and hoaxes. d. Define and discuss Internet security concepts, technologies, and protocols such as SSL/TLS, HTTP/S, instant messaging, Java Script, ActiveX, buffer overflows, cookies, and signed applets. e. Define and discuss wireless security concepts, technologies, and protocols such as WTLS, 802.11x, and WEP/WAP.	
3. Recognize domestic and international law regarding security.	DOK 1, NDI, ND7
a. Identify restrictions on import and export of encryption technologies. b. Discuss domestic and international law on apprehension and prosecution of cyber criminals. c. Explain the concept of digital rights management.	
4. Operate vulnerability testing tools.	DOK 2, NDI, ND7
a. Perform password cracking and auditing. b. Perform vulnerability testing. c. Perform port mapping. d. Use a protocol analyzer to capture packets. e. Demonstrate packet sniffing of text and passwords.	

5. Use operating system hardening.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6
a. Install service patches.	
b. Install encryption services.	
c. Establish access controls.	
6. Demonstrate use and operation of firewall configuration.	DOK 2, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Define common firewall terms.	
b. Install and configure port and service filters.	
c. Configure a simple firewall.	
d. Install and demonstrate a proxy server.	
7. Use logging and analysis.	DOK 2, ND1
a. Use baseline in log analysis.	
b. Configure centralized logging system.	
c. Review various operating system logging capabilities.	
d. Audit logons, system restarts, and specific resource use.	
8. Describe the elements of computer crimes and cyber attacks.	DOK 1, ND1, ND7
a. Identify the types of computer crimes and cyber attacks.	
b. Compare and contrast corporate and criminal investigations regarding electronic evidence (e-evidence).	
c. Discuss the role of computer forensics examiners in corporate and criminal investigations.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Network Planning and Design

Course Abbreviation: IST 2224

Classification: AOC Core (Computer Networking)

Description: This course involves applying network concepts in planning and designing a functioning network. Emphasis is placed on recognizing the need for a network, conducting an analysis, and designing a solution (4 sch: 2-hr lecture, 4-hr lab).

Prerequisites: Network Operating Systems Elective; Network Components (IST 1223)

Competencies and Suggested Objectives	
1. Perform analysis and design for developing a network.	DOK 3, ND1
a. Plan preliminary investigation. b. Create a data gathering strategy. c. Create a data analysis strategy. d. Discuss requirement reports.	
2. Determine hardware design.	DOK 1, ND1, ND2, ND3, ND4, ND5, ND6
a. Assess factors and components. b. Assess topology components. c. Assess cabling. d. Assess wireless requirements. e. Assess file server requirements. f. Assess workstation requirements. g. Assess design scalability, adaptability, and manageability.	
3. Determine software design.	DOK 2, ND1, ND2, ND3, ND4, ND5
a. Compare network operating systems. b. Compare workstation operating systems. c. Use network utilities. d. Evaluate network management applications. e. Examine virtualization.	
4. Examine current network technologies.	DOK 1, ND1, ND2, ND3, ND4, ND5
a. Discuss VLSM and CIDR. b. Discuss advances in switches and switch technologies. c. Implement VLANs. d. Discuss routing and routed protocols as they pertain to the local area network.	
5. Solve design cases.	DOK 4, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Analyze, design, and construct a solution for implementation of a local area network. b. Present this solution to a class.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

ND1 Perform Analysis

- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Network Implementation

Course Abbreviation: IST 2234

Classification: AOC Core (Computer Networking)

Description: This course is the culmination of all concepts learned in the network curriculum. Topics include planning, installation, evaluation, and maintenance of a network solution (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Network Planning and Design (IST 2224)

Competencies and Suggested Objectives	
1. Extend a local area network (LAN) to a wide area network (WAN).	DOK 2, ND1, ND2, ND3
a. Differentiate between LAN technologies and WAN technologies. b. Discuss WAN protocols (PPP, PPPoE, and frame relay). c. Implement WAN protocols.	
2. Discuss solutions for IP address shortage.	DOK 1, ND1, ND2, ND3, ND4, ND5, ND6
a. Discuss IPv4 and IPv6. b. Explain network address translation (NAT) and port address translation (PAT). c. Explain DHCP. d. Implement NAT and PAT. e. Implement DHCP.	
3. Plan and implement a network solution.	DOK 4, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Perform analysis and design of hardware and software. b. Create a network. c. Test the network. d. Monitor and troubleshoot the network. e. Assess the effectiveness of the network solution.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Advanced Network Administration Using Novell

Course Abbreviation: IST 2244

Classification: Technical Elective

Description: This course is a continuation of Network Administration Using Novell. Emphasis is placed on installation, configuration, and implementation of a Novell network (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Network Administration Using Novell (IST 1234)

Competencies and Suggested Objectives	
1. Review network administration.	DOK 1, ND1
a. Use directory services. b. Discuss file system. c. Discuss security. d. Discuss object creation and properties. e. Discuss printing.	
2. Connect client to the network.	DOK 2, ND1, ND3
a. Describe client communications within the network. b. Identify software required to connect. c. Discuss login files based on client type. d. Install and configure client software. e. Execute client files to connect. f. Discuss automatic update of client.	
3. Design, wire, and set up a functional network.	DOK 3, ND1, ND3, ND4, ND5, ND6
a. Discuss steps involved in installing Netware. b. Discuss DHCP. c. Install server operating system. d. Practice loading and unloading Netware loadable modules. e. Use console commands to evaluate installation and configuration.	
4. Install applications.	DOK 2, ND1, ND3, ND4, ND5, ND6
a. Create file structure for application installation. b. Install application on the server. c. Grant rights to users. d. Test installation. e. Configure application access through application launcher.	
5. Manage a printing environment.	DOK 2, ND1, ND5
a. Create a printing environment. b. Manage print jobs. c. Customize the print environment. d. Manage the print environment.	
6. Manage resources in a multi-context environment.	DOK 2, ND1, ND3, ND4, ND5, ND6
a. Describe how the directory structure affects network use. b. View sample directory structures and discuss organization of resources.	

c. Navigate the directory tree. d. Log in, map drives, and direct print jobs to resources in other contexts. e. Grant rights to resources and other contexts. f. Use directory map and alias objects to create shortcuts. g. Modify login scripts to access resources in another context.
7. Establish a backup and recovery policy. DOK 2, ND1, ND3, ND4, ND5, ND6 a. Describe the different backup types. b. Discuss backup strategies. c. Discuss Netware's backup utility. d. Discuss third party backup software. e. Perform a server backup. f. Implement a server restoration from backup media.
8. Manage the network. DOK 3, ND1, ND3, ND4, ND5, ND6 a. Discuss console commands and NLM's types. b. Use console commands to monitor, back up, and secure the server. c. Discuss volume. d. Discuss directory services repair. e. Discuss CD-ROM sharing. f. Explore remote console access.
9. Implement Internet and e-mail services. DOK 2, ND1, ND3, ND5 a. Discuss Internet service components. b. Discuss e-mail components. c. Install and configure Web services. d. Implement an e-mail system.
10. Research trends in new and emerging technologies. DOK 1, ND1

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth

Course Name: Advanced Network Administration Using Microsoft Windows Server

Course Abbreviation: IST 2254

Classification: Technical Elective

Description: This course is a continuation of Network Administration Using Microsoft Windows Server. Emphasis is placed on installation, configuration, and implementation of a functional server (4 sch: 2-hr lecture, 4-hr lab).

Prerequisites: Network Administration Using Microsoft Windows Server (IST 1244)

Competencies and Suggested Objectives	
1. Install a Windows server.	DOK 3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Compare upgrade options. b. Prepare computer for installation. c. Complete a server installation. d. Prepare server for server-based client installation. e. Complete a server upgrade.	
2. Use tools to configure a Windows server.	DOK 2, ND1
a. Discuss the registry. b. Discuss the control panel components. c. Examine administrative tools. d. Examine the policy editor. e. Examine the registry editor.	
3. Plan system policy and policy inheritance.	DOK 3, ND1, ND7
a. Explain system policies and how they work. b. Implement system policy at local, site, domain, and organization unit levels. c. Examine policy templates.	
4. Design network infrastructure.	DOK 4, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Plan the installation of network services. b. Implement Active Directory domain. c. Examine Windows DHCP management tool. d. Discuss Windows Internet naming service (WINS). e. Illustrate distributed processing. f. Contrast dial-up networking and remote routing access service (RRAS). g. Implement a RRAS Server. h. Discuss terminal services. i. Implement remote access for the administrator. j. Implement Windows backup service.	
5. Summarize Microsoft Server networking strategies.	DOK 1, ND1, ND3
a. Differentiate between Internet and intranet. b. Explain Microsoft Internet strategy. c. Configure Internet information server (IIS). d. Discuss interoperability with other platforms.	
6. Integrate network clients.	DOK 2, ND1, ND2, ND3

a. Discuss licensing.
b. Create installation startup disks.
c. Connect clients.
7. Discuss file replication and directory replication. ^{DOK 1, ND1}
a. Explain DFS.
b. Explain directory replication.
8. Audit system resources. ^{DOK 2, ND1, ND7}
a. Discuss resource auditing.
b. Create audit policy.
c. Perform system resource auditing.
d. Report and analyze information from audit logs.
9. Monitor system resources. ^{DOK 2, ND1, ND2, ND3, ND4, ND5}
a. Discuss system resource monitoring.
b. Use utilities to manage server properties.
c. Apply system alerts using the performance tool.
d. Perform remote administration.
10. Explore the boot process. ^{DOK 1, ND1}
a. Discuss failures in the boot process.
b. Examine the recovery console.
c. Discuss automated system recovery (ASR).
11. Tune and troubleshoot server. ^{DOK 3, ND1, ND2, ND3, ND4, ND5, ND6}
a. Identify bottlenecks.
b. Examine basic troubleshooting techniques.
c. Plan for and perform disaster recovery.
12. Discuss and implement RRAS. ^{DOK 3, ND1, ND2, ND3}
a. Discuss remote access capabilities.
b. Implement server as a router.
c. Implement server as a VPN server.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Advanced Network Administration Using Linux

Course Abbreviation: IST 2264

Classification: Technical Elective

Description: This course is a continuation of Network Administration Using Linux. This is an advanced administration course in network services for Linux users who wish to increase their skills. Students will learn how to apply security to network user profiles and resources, manage and compile the Linux kernel, manage network clients, and troubleshoot network processes and services (4 sch: 2-hr lecture, 4-hr lab).

Prerequisites: Network Administration Using Linux (IST 1254)

Competencies and Suggested Objectives	
1. Install and implement a Samba server.	DOK 3, ND1, ND3
a. Discuss smb, cifs, and data sharing with Windows operating systems. b. Discover and connect to Windows computers. c. Configure Windows clients. d. Complete a share that can be seen in the Windows Network Neighborhood.	
2. Apply file system management.	DOK 2, ND1, ND3, ND5
a. Explain partitions and partitioning software such as fdisk. b. Install drivers and mount an NTFS partition. c. Edit /etc/fstab to mount a partition at boot. d. Demonstrate repair of a file system with fsck.	
3. Manage backup and recovery strategies and techniques.	DOK 2, ND1, ND3, ND5
a. Develop a backup strategy. b. Discuss and assess backup media. c. Demonstrate file backup and recovery with tar. d. Demonstrate data backup and recovery with dd.	
4. Create a secure server.	DOK 4, ND1, ND3, ND5, ND6, ND7
a. Discriminate between necessary system services and unnecessary system services. b. Discover and restrict suid access to applications and to system and shared accounts. c. Install and implement a network firewall. d. Appraise firewall effectiveness. e. Test the firewall.	
5. Develop shell scripts.	DOK 2, ND1, ND3, ND5, ND6
a. Discuss task automation via shell scripting. b. Build scripts using basic script elements. c. Use script variables and control structures. d. Use iteration constructs. e. Investigate advanced scripting techniques.	
6. Compile software from source code.	DOK 2, ND1, ND3, ND5, ND6, ND7
a. Discuss the basics of C programming. b. Use the gnu C compiler (gcc and g++). c. Discuss the concept of shared libraries.	

- d. Perform a standard build process.
- e. Compile a kernel from source.
- f. Investigate Linux socket programming and network applications.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND3 Configure and Deploy Network
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Computer Programming Technology Courses

Course Name: Visual BASIC Programming Language

Course Abbreviation: IST 1314

Classification: Programming Elective (Computer Networking, Computer Programming, Web Development, Network Security); AOC Core (Database Administration)

Description: This introduction to the Visual BASIC programming language familiarizes the student with object-oriented programming and a graphical integrated development environment (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Describe the process of visual program design and development.	DOK1, P2
a. Define design time, run time, and break time. b. Identify compile errors, run-time errors, and logic errors. c. Discuss events, procedures, and classes.	
2. Describe the most common controls.	DOK1, P2
a. Illustrate the use of form controls, labels, buttons, text boxes, group boxes (frames), check boxes, and radio buttons (option buttons). b. Set properties of controls. c. Run events and methods on controls.	
3. Write programs using the various types of variables, constants, and relational operators.	DOK4, P2, P3, P4
a. Distinguish between variables and constants. b. Differentiate among the various data types. c. Select the appropriate scope for variables and constants. d. Perform calculations using the order of operations.	
4. Use decision, selection, and iteration statements.	DOK2, P2, P3, P4
a. Use IF/THEN statements to control the flow of logic. b. Use case statements to control selections. c. Use Do loops and For/Next loops as iteration statements.	
5. Create menus and message boxes.	DOK2, P2, P3, P4
a. Build applications that contain menus, submenus, and pop-up menus. b. Add access keys, shortcuts, separator bars, and checkmarks to menus. c. Create message boxes to display errors or information to the user.	

STANDARDS*NWCET Skill Standards for Information Technology—Programming/Software Engineering*

- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program

Course Name: Survey of Microcomputer Applications

Course Abbreviation: CPT 1323

Classification: Technical Elective

Description: This course introduces the student to microcomputer operation, word processing, spreadsheets, and database management (3 sch: 2 hr. lecture, 2 hr. lab).

Prerequisite: None

Competencies and Suggested Objectives
1. Apply a basic understanding of an operating system. DOK2, P1, P2, P3 a. Show basic commands of operating system software. (1) Use proper file and disk management. (2) Explore files and folders. (3) Create folders. (4) Copy and move files and folders. b. Illustrate the use of word processing software. (1) Produce a new document. (2) Format text and paragraphs. (3) Copy/move/format text. (4) Insert graphics. c. Demonstrate the use of spreadsheet software. (1) Produce a new spreadsheet. (2) Set up row and column headings. (3) Enter text and formulas. (4) Copy/move/format text and formulas. (5) Create and modify charts. d. Explore and utilize a database management program. (1) Create a database. (2) Create a table and data. (3) Modify table data within a database. (4) Apply reports in a database. (5) Query a database to extract information. (6) Create and use database forms. e. Illustrate the use of a presentation program. (1) Create a presentation. (2) Select slide layouts. (3) Select a design template. (4) Enter and format text on a slide. (5) Insert graphics on a slide. (6) Show a presentation. (7) Modify slide transitions and slide animation. f. Transfer data between applications. (1) Import/export word processing text.

- | |
|--|
| <ul style="list-style-type: none">(2) Import/export database fields.(3) Import/export spreadsheet data and/or charts. |
|--|

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program

Course Name: RPG Programming Language

Course Abbreviation: IST 1324

Classification: Programming Elective

Description: This course is designed to introduce the student to the RPG language for the creation of business applications (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Web and Programming Concepts (IST 1154) **OR** Web Development Concepts (WDT 1123) and Programming Development Concepts (CPT 1143) **OR** permission of instructor

Competencies and Suggested Objectives	
1. Discuss the development of the Report Program Generator (RPG) language.	DOK1, P1
a. Identify the purpose of RPG.	
b. Discuss the history of RPG.	
2. Apply the steps of the program development cycle.	DOK2, P1, P3
a. Use the steps involved in the creation of RPG programs.	
b. Use design forms to produce input layouts and output layouts.	
3. Apply RPG specifications for a simple program.	DOK2, P1, P3
a. Use the RPG language to design and implement the reading of data and to print a report with headings and edit codes.	
4. Apply the RPG syntax to perform arithmetic and assignment operations.	DOK2, P1, P3
a. Use the RPG language to design and implement calculation specifications, producing a report with accumulated totals.	
b. Demonstrate knowledge and use of numeric literals and fields.	
c. Demonstrate knowledge and use of character literals and fields.	
d. Demonstrate knowledge and use of figurative constants.	
5. Develop RPG programs using a top-down, structured approach.	DOK4, P1, P3, P4, P5
a. Develop programs using sequence, selection, and iteration.	
b. Develop programs using modular coding techniques.	
c. Prepare the coding necessary to perform control break logic.	
d. Use control break logic to produce a report with subtotals and final totals.	
e. Use selection logic to produce exception output reporting.	
6. Use RPG operations for file access and record manipulation.	DOK2, P1, P3, P4, P5
a. Use RPG file operations for sequential access of records to produce a report.	
b. Use RPG file operations for random access of records to produce a report.	
c. Use RPG file operations for writing records to a data file.	
d. Use RPG file operations for updating and deleting data file records.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

P1 Perform Analysis

- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: COBOL Programming Language

Course Abbreviation: IST 1334

Classification: Technical Elective

Description: This course is designed to introduce the student to the use of the COBOL language for business applications, including arithmetic operations, report editing, control break processing, and table processing techniques (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Web and Programming Concepts (IST 1154) **OR** Web Development Concepts (WDT 1123) and Programming Development Concepts (CPT 1143) **OR** permission of instructor

Competencies and Suggested Objectives	
1. Discuss the divisions of a COBOL program.	DOK1, P1, P3
a. Identify the divisions of a COBOL program.	
b. Apply the steps involved in designing, coding, executing, and debugging COBOL programs.	
c. Use structured programming techniques in all programs.	
2. Use arithmetic operations.	DOK2, P1, P3
a. Develop a program that includes addition, subtraction, multiplication, and division; compute.	
b. Develop a program that includes computation of totals.	
3. Develop a program that includes signs, zero suppression, and insertion characters.	DOK2, P1, P3
4. Prepare edited reports.	DOK2, P5
5. Develop a program that includes logical comparison.	DOK2, P3
6. Produce reports to initiate control break processing.	DOK2, P1, P3, P4, P5
a. Develop a program that includes single-level control breaks.	
b. Develop a program that includes multi-level control breaks.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: Fundamentals of Virtualization

Course Abbreviation: IST 1483

Classification: Vocational Technical Elective

Description: This course presents basic concepts of operating-system virtualization, server virtualization, cloning, teams, and virtual networks (3 sch: 2 hr lecture, 2 hr lab).

Prerequisite: IST 1124

Competencies and Suggested Objectives	
1. Explore system requirements.	DOK1, ND1
a. Identify host system requirements.	
b. Examine virtual machine specification and supported guest operating systems	
2. Install and configure virtual software.	DOK2, ND1, ND2, ND3
a. Identify installation prerequisites.	
b. Install virtual software on Windows and Linux hosts.	
3. Explore the basics of virtual software.	DOK1, ND1, ND2, ND3
a. Configure preferences in virtual software.	
b. Identify the windows in virtual software.	
c. Identify and configure virtual-machine settings.	
d. Create a virtual machine quickly.	
e. Perform a shutdown of a virtual machine and exit the software.	
4. Explore creating and upgrading a virtual machine.	DOK2, ND1, ND2, ND3
a. Configure memory allocation, virtual-machine location, network connection type, and virtual and physical disks.	
b. Perform a manual installation of a guest operating system.	
c. Upgrade a guest operating system.	
d. Identify files that make up a virtual machine.	
5. Identify various ways of installing a virtual machine.	DOK2, ND1, ND2, ND3
a. Install a virtual machine using an ISO.	
b. Install a virtual machine from an existing physical machine.	
6. Practice maintaining a virtual machine.	DOK2, ND1, ND2, ND3, ND4, ND5, ND6
a. Configure autologon in a Windows guest virtual machine.	
b. Use the pause and unpause features in a virtual machine.	
c. Use the encryption feature to encrypt a virtual machine.	
d. Remove a virtual machine.	
7. Practice file maintenance with virtual machines.	DOK2, ND1, ND2, ND3
a. Use the drag-and-drop and copy-and-paste features to transfer files between the host and guest.	
b. Use and set up shared folders.	
c. Practice mapping or mounting a virtual disk to a drive on the host.	
8. Explore preserving the state of a virtual machine.	DOK1, ND1, ND2, ND3, ND4
a. Use the suspend and resume features.	

b. Use snapshots to preserve the state of a virtual machine.	
9. Practice cloning, moving, and sharing virtual machines.	DOK2, ND1, ND2, ND3, ND4, ND5, ND6
a. Configure a linked clone and full clone.	
b. Practice moving a virtual machine to another host.	
c. Practice sharing a virtual machine with another user.	
10. Explore recording and replaying virtual machine activity.	DOK2, ND1, ND2, ND3, ND4, ND5, ND6
a. Use the record feature to create a recording.	
b. Use the replay feature to replay a recording.	
c. Use the trace feature to create a trace file of a recording.	
11. Explore teams of a virtual machine.	DOK1, ND1, ND2, ND3, ND4, ND5, ND6
a. Identify benefits of using teams.	
b. Practice creating and opening teams.	
c. Practice closing and powering off teams.	
d. Practice deleting a team.	
e. Configure teams by adding and removing members.	
12. Practice configuring a virtual network.	DOK2, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Identify the components of a virtual network.	
b. Configure a bridged, host-only, and NAT virtual network.	
c. Practice changing the subnet and DHCP settings in a virtual network.	
d. Configure host virtual network adapters.	
13. Explore connecting devices to virtual machines.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6
a. Configure a parallel port to a virtual machine.	
b. Practice adding a virtual serial port.	
c. Configure keyboard features in a virtual machine.	
d. Use USB devices in a virtual machine.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Java Programming Language

Course Abbreviation: IST 1714

Classification: Technical Elective

Description: This introduction to the Java programming language is to include sort, loops, arrays, and applets (4 sch: 2 hr. lecture, 4 hr. lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Develop programs that use arithmetical operations and logical operations.	DOK2, P1, P3
a. Use variables, constants, and strings.	
b. Use methods, classes, and objects.	
2. Develop programs using decision making and conditional breaks.	DOK2, P1, P3
a. Develop programs that utilize the “if and if...else” structure.	
b. Develop programs that utilize the nested If structure.	
3. Use looping structures in programs.	DOK2, P1, P3
a. Develop programs that implement “while” and “do while” loops.	
b. Develop programs that implement “for the” loop.	
c. Develop programs that implement nested loops.	
4. Use arrays.	DOK2, P1, P3
a. Develop programs that require defining, loading, and searching an array.	
b. Develop programs that sort an array.	
5. Use applets.	DOK2, P1, P3, P4, P5
a. Develop a HTML program to host an applet.	
b. Develop a complete interactive applet.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: Systems Analysis and Design

Course Abbreviation: IST 2314

Classification: AOC Core (Computer Programming)

Description: This course introduces techniques used in systems analysis and design. Emphasis will be placed on the design, development, and implementation of an information system (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: At least one introductory programming language course.

Competencies and Suggested Objectives	
1. Examine the role of systems analysts.	DOK1, P1
a. Identify the functions of systems analysts.	
b. Identify skills required for systems analysts.	
2. Demonstrate the steps involved in a system project.	DOK2, P1, P2, P3
a. Employ the phases in a system project.	
b. Employ basic fact-gathering techniques.	
3. Discuss initiation of a system project and preliminary investigation.	DOK1, P1, P2, P3, P4
a. Plan the objectives of preliminary investigation.	
b. Conduct a preliminary investigation.	
4. Apply a detailed system investigation and analysis.	DOK2, P1
a. Use detailed system investigation techniques.	
b. Record facts gathered in a detailed system investigation.	
5. Apply the system design phase.	DOK2, P1, P2, P3, P4, P5
a. Use the steps in system design.	
b. Design system output files, system input files, and processing.	
c. Present system design to management.	
6. Apply system development techniques.	DOK2, P1, P2, P3, P4, P5
a. Demonstrate the tasks involved in systems development.	
b. Write programming specifications.	
c. Program, test, and document the system.	
7. Apply system implementation and evaluation.	DOK2, P1, P2, P3, P4, P5, P6
a. Plan the conversion method for existing files.	
b. Convert existing files.	
c. Implement the system.	
d. Conduct post-implementation evaluation.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
P2 Develop Structure

- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program
- P6 Release Product

Course Name: Script Programming Language

Course Abbreviation: IST 2324

Classification: Programming Elective (Computer Programming)

Description: This course is an introduction to the use of integrating scripts to add functionality to Web pages (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Web and Programming Concepts (IST 1154) **OR** Web Development Concepts (WDT 1123) and Programming Development Concepts (CPT 1143) **OR** permission of instructor

Competencies and Suggested Objectives	
1. Explore script programming fundamentals. ^{DOK1, P3}	a. Explain scripting languages. b. Discuss various scripting languages. c. Discuss client-side versus server-side. d. Demonstrate embedding in HTML.
2. Examine programming language fundamentals and syntax. ^{DOK1, P3}	a. Explain objects, variables, data types, and scope. b. Implement control structures, operators, logical expressions, and statements. c. Use functions, methods, procedures, subroutines, modules, etc. d. Discuss inline scripting, simple user events, and the onLoad and onUnload event handlers.
3. Examine script control structures and statements. ^{DOK1, P3}	a. Discuss decision statements. b. Describe repetition statements.
4. Explain script functions, methods, and events. ^{DOK2, P3}	a. Explain functions. b. Discuss defining and calling functions. c. Discuss event handlers.
5. Discuss script cookies and security. ^{DOK1, P3}	a. Explain the state information. b. Describe query strings. c. Save state information with cookies. d. Explain script security issues.
6. Explore the server-side environment. ^{DOK1, P3, P4}	a. Differentiate between server-side and client-side programming. b. Discuss middleware. c. Illustrate the data flow process. d. Download, install, and/or configure required software.
7. Explain string manipulation. ^{DOK2, P3, P4}	a. Use built-in string functions. b. Employ regular expressions and pattern matching.
8. Demonstrate form processing. ^{DOK2, P3, P4}	

- a. Evaluate form submission methods.
- b. Validate and process user-entered data.
- c. Create form-based file upload.

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P3 Design/Develop Program
P4 Implement Program

Course Name: Advanced Visual BASIC Programming Language

Course Abbreviation: IST 2334

Classification: Programming Elective (Computer Programming)

Description: This course is a continuation of the Visual BASIC Programming Language course (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Visual BASIC Programming Language (IST 1314)

Competencies and Suggested Objectives	
1. Use array/table structures.	DOK2, P1, P2, P3
a. Create programs that require defining, loading, and searching an array/table.	
b. Create programs that use arrays to store data.	
2. Demonstrate database access.	DOK2, P1, P2, P3
a. Retrieve and process data.	
b. Update/maintain database records.	
c. Compose basic SQL statements.	
3. Demonstrate the use of controls and properties for database files.	DOK2, P1, P2, P3
a. Build an application that uses the data control or data adapters and data sets.	
b. Build an application using the datagrid control.	
4. Use text files.	DOK2, P1, P2, P3, P5
a. Create and read data files.	
b. Read and write records to a data file.	
c. Use error checking on files.	
5. Build multi-tier programs.	DOK2, P1, P2, P3
a. Create your own class and instance based on the class.	
b. Divide an application into multiple tiers.	
6. Create Web applications.	DOK2, P1, P2, P3, P4, P5, P6
a. Create a Web form.	
b. Create a data-driven application.	
7. Demonstrate different reporting options.	DOK2, P1, P2, P3, P4, P5
a. Write reports to be printed.	
b. Write reports using the Crystal Reports module of Visual BASIC.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

P6 Release Product

Course Name: Database Programming and Design

Course Abbreviation: IST 2344

Classification: Technical Elective

Description: This course will introduce programming using a database management software application. Emphasis will be placed on menus and file maintenance (4 sch: 2-hr lecture, 4-hr lab).

Prerequisites: Visual BASIC Programming Language (IST 1314) and Concepts of Database Design (IST 1163)

Competencies and Suggested Objectives	
1. Discuss the phases involved in developing a project.	DOK1, P1, P2
a. Identify each phase and its importance during project development.	
2. Create a database management system (DBMS).	DOK4, P1, P2, P3, P4
a. Define basic terminology.	
b. Create a DBMS using multiple tables, simple and compound queries, complex forms, and complex reports, to include the following:	
• Multiple tables with data types, input mask, valuation rules, etc.	
• Simple and compound queries that sort, extract, and delete information from tables	
• Complex forms that edit, delete, and add information to tables	
• Complex reports that sort, calculate, and retrieve information from queries and multiple tables, switchboards, and passwords	
3. Implement a database as the backend of a project.	DOK2, P1, P2, P3, P4
a. Using the created DBMS, remove all features except tables.	
b. Create the user interface using Visual BASIC (VB), including calculations, additions, deletions, and modifications of fields in the DBMS tables.	
c. Create reports using the Crystal Reports module of VB.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program

Course Name: Advanced RPG Programming Language

Course Abbreviation: IST 2354

Classification: Technical Elective

Description: This course is a continuation of the RPG Programming Language course. Emphasis is placed on advanced table processing, file maintenance, and interactive programming (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: RPG Programming Language (IST 1324)

Competencies and Suggested Objectives	
1. Integrate Report Program Generator (RPG) techniques to develop interactive applications. DOK2, P1, P2, P3	a. Illustrate table and array definition techniques. b. Illustrate methods of loading data into tables and arrays. c. Illustrate techniques to search tables and arrays. d. Develop an RPG program using table and array techniques.
2. Create interactive applications using RPG techniques. DOK2, P1, P2, P3, P4, P5	a. Create display screen formats to be used in RPG interactive application programs. b. Use RPG programming theory and techniques to develop interactive RPG programs to maintain database files.
3. Demonstrate the ability to create, compile, and test CL programs. DOK2, P1, P2, P3, P4, P5	a. Explore parameters and their flexibility. b. Declare and manipulate program variables. c. Investigate CL control structures. d. Use files and data areas in a CL program.
4. Produce and evaluate business applications of the RPG language using the program development cycle. Complete a case study that requires the use of RPG to do the following: DOK4, P1, P2, P3, P4, P5	a. Use design tools to plan and design. b. Code using specification sheets. c. Enter and compile using a mid-range computer. d. Test and correct using appropriate test data. e. Document using comments.

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: Advanced COBOL Programming Language

Course Abbreviation: IST 2364

Classification: Programming Elective (Computer Programming)

Description: This course is a continuation of the COBOL Programming Language course. Emphasis is placed on advanced table processing, file maintenance, and interactive programming (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: COBOL Programming Language (IST 1334)

Competencies and Suggested Objectives	
1. Create programs for processing tables/arrays.	DOK2, P1, P2, P3, P4
a. Create programs with single-dimensional tables/arrays.	
b. Create programs with multi-dimensional tables/arrays.	
2. Use multiple level tables/arrays.	DOK2, P1, P2, P3
a. Formulate sequential searches.	
b. Formulate binary searches.	
3. Create programs that re-sequence data.	DOK3, P1, P2, P3, P4, P5, P6
a. Develop a program that incorporates a sort routine.	
b. Use the merge command.	
c. Employ logical files.	
4. Create a program that illustrates file maintenance techniques.	DOK3, P1, P2, P3
a. Create a program that adds records to a file.	
b. Create a program that changes records in a file.	
c. Create a program that deletes records from a file.	
5. Apply interactive programming techniques.	DOK2, P1, P2, P3
a. Develop a program that uses screens for input and output.	
b. Develop a program that uses subfile processing.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: C Programming Language

Course Abbreviation: IST 2374

Classification: Programming Elective

Description: This course is designed to introduce the student to the C programming language and its basic functions (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Successful completion of any IST programming language course or permission of instructor

Competencies and Suggested Objectives	
1. Demonstrate proper programming techniques.	DOK2, P1, P2, P3
a. Use structured design and coding techniques in all programs.	
2. Use fundamental C concepts.	DOK2, P1, P2, P3
a. Develop programs that use the following:	
(1) Input/output	
(2) Arithmetic operations	
(3) Operator precedence	
3. Use decision-making techniques.	DOK2, P1, P2, P3
a. Develop a program using conditional and relational operations.	
b. Develop a program using a switch statement.	
4. Use repetitive structures.	DOK2, P1, P2, P3
a. Create programs using various loops.	
5. Develop a program that uses preprocessor commands.	DOK2, P1, P2, P3
6. Use functions.	DOK2, P1, P2, P3, P4, P5, P6
a. Prepare programs that pass parameters to functions by reference and by value.	
b. Use recursive function calls in a program.	
7. Use C's string handling capabilities.	DOK2, P1, P2, P3
a. Create a program using string manipulation.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program
- P6 Release Product

Course Name: Advanced C Programming Language

Course Abbreviation: IST 2384

Classification: Programming Elective (Computer Programming)

Description: This course is a continuation of the C Programming Language course (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: C Programming Language (IST 2374)

Competencies and Suggested Objectives	
1. Use array processing.	DOK2, P1, P2, P3
a. Create a program that uses a single-dimension array.	
b. Create a program that uses a multidimension array.	
2. Review pointers and linked lists.	DOK1, P1
3. Review functions.	DOK1, P1
a. Discuss passing arguments by reference and value.	
b. Discuss recursive functions.	
c. Describe points to functions.	
d. Explore arrays as function arguments.	
4. Classify user-defined data types.	DOK3, P1, P2, P3
a. Explain the typedef statement.	
b. Examine enumerated types.	
c. Compare named and anonymous data types.	
d. Create and employ user-written header files.	
5. Explore records (C++ Structs).	DOK1, P1, P2, P3, P4
a. Analyze records, arrays of records, and hierarchical records.	
b. Implement appropriate data structures.	
6. Demonstrate classes and data abstraction.	DOK2, P1, P2, P3
a. Compare public and private class members.	
b. Explain class scope and information hiding.	
c. Compile and link a multifile program.	
d. Discuss constructors and destructors.	
7. Create object-oriented programming.	DOK3, P1, P2, P3
a. Explain objects.	
b. Discuss inheritance and composition.	
c. List the steps in object-oriented design.	
7. Evaluate linked structures.	DOK3, P1, P2, P3
a. Compare sequential structures and linked structures.	
b. Explore dynamic data representation.	
8. Develop exception-handling routines.	DOK3, P1, P2, P3, P4, P5, P6
a. Evaluate exception-handling types.	
b. Examine exception hierarchies and resource management.	
c. Design programs that include exception handlers.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program
- P6 Release Product

Course Name: Career Development

Course Abbreviation: CPT 2133

Classification: Technical Elective

Description: This course provides practical exercises in both the technical and social skills necessary for employment. Interpersonal skills, the job search process, and the importance of high standards of personal and professional relationships are stressed (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: Written Communications Elective or permission from instructor

Competencies and Suggested Objectives	
1. Assess personal traits. ^{DOK1}	a. Categorize strengths and weaknesses. b. Perform an interest inventory. c. Incorporate techniques to build a positive self-image.
2. Demonstrate effective interpersonal skills. ^{DOK2}	a. Apply techniques to improve listening, verbal, and nonverbal communication skills. b. Examine special communication requirements with people from diverse cultural and international backgrounds and with the differently abled. c. Apply business etiquette skills. d. Apply problem-solving and conflict-resolution skills.
3. Formulate career goals and objectives. ^{DOK2}	a. Discuss the importance of goals and objectives. b. Determine a personal career path.
4. Compare and contrast factors associated with job success. ^{DOK3}	a. Discuss elements of a professional image. b. Apply basics of good health practices. c. Build a proper business wardrobe. d. Practice personal grooming.
5. Practice the job search process. ^{DOK2}	a. Research the job market. b. Complete job applications. c. Prepare a resume. d. Write appropriate job-related correspondence. e. Demonstrate proper business appearance. f. Practice effective interview techniques through mock interviews.
6. Demonstrate factors that contribute to success on the job. ^{DOK2}	a. Demonstrate time, stress, and money management techniques. b. Determine positive work habits. c. Discuss the importance of a positive attitude.

Course Name: Client-Side Programming

Course Abbreviation: IST 1414

Classification: Programming Elective (Computer Programming; Database Administration)

Description: This course offers a comprehensive understanding of programming using JavaScript (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Web and Programming Concepts (IST 1154) **OR** Web Development Concepts (WDT 1123) and Programming Development Concepts (CPT 1143) **OR** permission of instructor

Competencies and Suggested Objectives
1. Demonstrate client-side programming using JavaScript. ^{DOK2, WD2, WD3} a. Apply JavaScript fundamentals. (1) Explain scripting languages. (2) Discuss JavaScript versus other languages. (3) Discuss client-side versus server-side programming. (4) Demonstrate embedding in HTML. b. Discuss JavaScript variables and data. (1) Demonstrate communicating with the user. (2) Explain variables and keywords. (3) Discuss expressions and operators. (4) Discuss inline scripting, simple user events, and the onLoad and onUnload event handlers. c. Explain functions, methods, and events. (1) Discuss functions. (2) Use defining and calling functions. (3) Use event handlers. d. Apply control structures and statements. (1) Apply decision statements. (2) Apply repetition statements. e. Examine the document object model (DOM). (1) Identify properties and methods of the window object. (2) Identify properties and methods of the location object. (3) Identify properties and methods of the history object. (4) Identify properties of the navigator object. f. Examine forms. (1) Discuss validation. (2) Validate form data. g. Discuss cookies and security. (1) Explain state information. (2) Describe query strings. (3) Save state information with cookies. (4) Explain JavaScript security issues.

- h. Debug JavaScript.
 - (1) Use debugging tools.
 - (2) Discuss debugging techniques.

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD2 Perform Web Programming

WD3 Develop, Deliver, and Manage Content

Course Name: Web Design Applications

Course Abbreviation: IST 1424

Classification: Technical Elective

Description: This course involves the application of various professional and personal Web design techniques. Students will work with the latest WYSIWYG editors, HTML editors, animation/multimedia products, and photo editors (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Web and Programming Concepts (IST 1154) **OR** Web Development Concepts (WDT 1123) and Programming Development Concepts (CPT 1143) **OR** permission of instructor

Competencies and Suggested Objectives
1. Design Web pages using various applications. ^{DOK4, WD3} a. Demonstrate WYSIWYG editor applications. (1) Define and use terminology related to WYSIWYG editor applications. (2) Create and edit Web content utilizing WYSIWYG editor applications. b. Demonstrate HTML editor applications. (1) Define and use terminology related to HTML editor applications. (2) Create and edit Web content utilizing HTML editor applications. c. Demonstrate animated/multimedia applications. (1) Define and use terminology related to creating and using multimedia interactive applications. (2) Develop and edit animated/multimedia content specific for Web applications. d. Demonstrate digital image editing applications. (1) Define and use terminology related to creating and using image editing applications. (2) Create and edit Web digital images specifically for Web content.

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD3 Develop, Deliver, and Manage Content

Course Name: Web Site and Systems Development

Course Abbreviation: CPT 2354

Classification: Technical Elective

Description: This course introduces techniques used in systems analysis, design, maintenance, security, and evaluation. Emphasis will be placed on the design and development of Web-based systems (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Concepts of Database Design (IST 1163) and Web Server (IST 2483) or by permission of instructor.

Competencies and Suggested Objectives	
1. Evaluate and implement Web site and systems development processes.	DOK4, WD1
a. Identify the scope of a large-scale project (individual or team-based).	
b. Outline the workflow.	
c. Discuss time and cost management.	
d. Discuss the purpose of a customer service policy.	
e. Analyze hardware and software feasibility.	
f. Describe interface with data storage devices.	
2. Plan, design, publish, and analyze a commercial Web site.	DOK4, WD1, WD2, WD3, WD4, WD5, WD6, WD7, WD8
a. Use system design steps.	
b. Perform detailed system investigation and analysis.	
c. Code, test, and document the project.	
d. Apply project implementation and evaluation.	
3. Create a portfolio.	DOK4, WD1, WD2, WD3, WD4, WD5, WD6, WD7, WD8
a. Create a personal Web site that includes a resume and links to other work.	
b. Create a CD that includes all Web designs produced and/or published.	

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

- WD1 Perform Technical Analysis
- WD2 Perform Web Programming
- WD3 Develop, Deliver, and Manage Content
- WD4 Implement and Maintain Site and Applications
- WD5 Manage Web Environment
- WD6 Manage Enterprise-wide Web Activities
- WD7 Perform Testing and Quality Assurance
- WD8 Develop and Implement Web Database

Course Name: XML Programming

Course Abbreviation: IST 2424

Classification: Programming Elective

Description: This course provides a comprehensive understanding of the Extensible Markup Language (XML) (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Web and Programming Concepts (IST 1154) **OR** Web Development Concepts (WDT 1123) and Programming Development Concepts (CPT 1143) **OR** permission of instructor

Competencies and Suggested Objectives	
1. Outline the history and development of SGML, HTML, and XML.	DOK1, WD3, WD7
a. Summarize evolution of XML. b. Explore XML development organizations. c. Examine W3C specifications and guidelines. d. Discuss XML directives. e. Examine XML-driven technologies. (1) Outline the XML family of technologies. (2) Compare various XML-based languages.	
2. Compare XML tools; explore document components and structure.	DOK2, WD3, WD7
a. Use XML creation and editing software. b. Examine XML browsers. c. Explain XML parsers. d. Explain XML tags. e. Discuss XML elements and attributes. f. Compare parent–child relationships. g. Create well-formed XML documents. h. Define the XML namespace.	
3. Assess XML validation, transformation, and styling.	DOK2, WD3, WD7
a. Discuss the document object model (DOM). b. Describe XML document type declarations. c. Explain XML encoding. d. Use XML validator. e. Analyze XML schemas. f. Differentiate CSS, XSL, and XSLT. g. Critique style sheet syntax. h. Discover data binding and data islands.	

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD3 Develop, Deliver, and Manage Content

WD7 Perform Testing and Quality Assurance

Course Name: Server-side Programming I

Course Abbreviation: IST 2434

Classification: Programming Elective (Computer Networking; Computer Programming; Database Administration)

Description: This course provides the student with an introduction to creating dynamic Web applications using server-side technologies (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Client-Side Programming (IST 1414)

Competencies and Suggested Objectives	
1. Create Web applications using server-side technologies.	DOK4, WD2, WD3, WD5
a. Explore the server-side environment.	
(1) Differentiate between server-side and client-side programming.	
(2) Discuss middleware.	
(3) Illustrate the data flow process.	
(4) Download, install, and/or configure required software.	
b. Examine programming language fundamentals and syntax.	
(1) Explain objects, variables, data types, and scope.	
(2) Implement control structures, operators, logical expressions, and statements.	
(3) Use functions, methods, procedures, subroutines, modules, etc.	
c. Explain string manipulation.	
(1) Use built-in string functions.	
(2) Employ regular expressions and pattern matching.	
d. Demonstrate form processing.	
(1) Evaluate form submission methods.	
(2) Validate and process user-entered data.	
(3) Create form-based file upload.	
e. Discuss file system interaction and directory services.	
(1) Demonstrate file object creation and destruction.	
(2) Use directory functions.	
(3) Create, delete, and move files and directories.	
(4) Retrieve and change file properties.	
(5) Identify file opening modes.	
(6) Read, write, and append file data.	

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

WD2 Perform Web Programming

WD3 Develop, Deliver, and Manage Content

WD5 Manage Web Environment

Course Name: Server-side Programming II

Course Abbreviation: IST 2444

Classification: Programming Elective (Computer Networking; Computer Programming; Database Administration)

Description: This course is a continuation of Server-side Programming I with an increased emphasis on data-driven content (4 sch: 2-hr lecture, 4-hr lab)

Prerequisite: Server-side Programming I (IST 2434)

Competencies and Suggested Objectives	
1. Create Web applications using advanced server-side technologies. a. Extend programming capabilities. (1) Discuss, install, and use add-ins, modules, and so forth. b. Use Web database technologies. (1) Identify data-driven content. (2) Explore SQL fundamentals. (3) Establish database connectivity. (4) Perform database operations. c. Identify benefits of reusable code. (1) Discuss parameters, scope, and passing data. (2) Return data from functions, methods, procedures, subroutines, modules, etc. d. Explore object-oriented programming concepts. (1) Illustrate classes and objects. (2) Explain polymorphism and inheritance. (3) Discuss class structure, constructors, destructors, and instantiation. (4) Demonstrate use of class attributes and call class operations. e. Employ application structure techniques. (1) Diagram application architecture. (2) Discuss coding standards and practices. (3) Establish naming conventions. (4) Demonstrate use of standard directory structure. (5) Organize code into logical units. f. Maintain the state between the client and server. (1) Describe the uses and types of cookies. (2) Create, modify, read, and delete cookies. (3) Discuss session identifiers. (4) Store, retrieve, and remove session variables. g. Analyze security issues. (1) Explore error handling techniques. (2) Discuss user authentication procedures. (3) Demonstrate encryption methods.	DOK4, WD2, WD3, WD5, WD8

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

- WD2 Perform Web Programming
- WD3 Develop, Deliver, and Manage Content
- WD5 Manage Web Environment
- WD8 Develop and Implement Web Database

Course Name: Mobile Application Development

Course Abbreviation: IST 2454

Classification: Computer Programming Elective; Technical Elective

Description: The emergence of a new generation of highly-capable mobile devices and platforms has opened up opportunities for application developers. However, mobile development differs from conventional desktop development in that mobile devices operate in a constrained world with smaller screens, slower network connections, as well as limited memory and processing power. (3 sch: 2 hr lecture, 2 hr lab)

Prerequisite: Visual BASIC Programming (IST 1314)

Competencies and Suggested Objectives	
1. Distinguish between the types of application platforms.	DOK 2, P1
a. Identify and evaluate desktop applications. b. Identify and evaluate native mobile applications. c. Identify and evaluate Internet/Web-based applications.	
2. Recognize the benefits, implications, and significance of mobile applications.	DOK 1, P1
a. Discuss the convenience and mobility of mobile applications. b. Examine the competition among businesses and organizations caused by the emergence of mobile applications. c. Examine the security issues involved with mobile applications.	
3. Compare existing software technologies used in the development of mobile applications.	DOK 2, P1, P2, P3
a. Evaluate Xcode software (Cocoa Frameworks/Objective-C/iOS simulator). b. Evaluate Eclipse software (Android development tools/Android application framework/Java/Android device simulator). c. Evaluate Windows Phone software (Windows Phone SDK, Visual Studio) d. Evaluate other software technologies as developed.	
4. Compare the hardware used by mobile applications.	DOK 2, P1
a. Investigate smartphone hardware and its capabilities. b. Investigate tablet hardware and its capabilities.	
5. Design effective user interfaces for mobile platforms.	DOK 3, P1, P2, P3
a. Demonstrate effective use of screen real estate. b. Demonstrate effective use of accelerometers, global positioning systems, and other onboard devices. c. Demonstrate effective use of touch input.	
6. Design and deliver a mobile application.	DOK 4, P1, P2, P3, P4, P5
a. Demonstrate effective use of object-oriented programming in the design of mobile applications.	
7. Discuss the distribution methods of mobile applications.	DOK 1, P4, P5
a. Compare the various channels for application distribution.	

STANDARDS

NWCET Skill Standards for Information Technology—Programming/Software Engineering

- P1 Perform Analysis
- P2 Develop Structure
- P3 Design/Develop Program
- P4 Implement Program
- P5 Test and Validate Program

Course Name: E-commerce Strategies

Course Abbreviation: IST 2473

Classification: Technical Elective

Description: This course provides opportunities for students to examine strategies and products available for building electronic commerce sites, how such sites are managed, and to explore how they can complement an existing business infrastructure. Students get hands-on experience implementing the technology to engage cardholders, merchants, issues, payment gateways, and other parties in electronic transactions (3 sch: 2-hr lecture, 2-hr lab).

Prerequisites: Server-side Programming I (IST 2434)

Competencies and Suggested Objectives	
1. Design electronic commerce sites.	DOK4, WD1, WD2, WD3, WD8
a. Construct an online product promotion.	
(1) Identify Web marketing goals.	
(2) Examine existing Web marketing models.	
(3) Create marketing goals and strategies.	
(4) Identify the target market.	
(5) Evaluate positive and negative growth factors.	
(6) Compute product pricing.	
(7) Specify product distribution and availability.	
(8) Generate banner ads.	
(9) Track banner ads.	
(10) Develop customer incentives.	
(11) Manipulate search engine placement.	
(12) Design effective e-mail marketing strategies.	
b. Critique e-business models.	
(1) Assess e-service methods.	
(2) Differentiate between synchronous and asynchronous services.	
(3) Create user-friendly self-service strategies.	
(4) Analyze successful customer relationship management practices.	
(5) Identify customer relationship management (CRM) software.	
(6) Compare customized, interactive Web sites that exemplify effective CRM strategies.	
(7) Differentiate business to business, business to consumer, consumer to business, and consumer to consumer models.	
(8) Describe market places, portals, and hubs.	
(9) Explain supply chains and procurement.	
(10) Discuss inventory, freight and shipping arrangements, and order tracking processes.	
(11) Identify interoffice productivity and cost reduction tools.	
c. Develop storefront solutions.	
(1) Determine outsourcing needs.	

- (2) Appraise storefront packages.
- (3) Define security, privacy, and ethical issues (i.e., credit card transaction, copyrights, encryption, and cookies).
- (4) Assess Web site performance.
 - (a) Test links.
 - (b) Measure download time on different connection speeds.
- d. Discuss payment systems and security.
 - (1) Discuss electronic payment media.
 - (2) Describe e-commerce threats.
 - (3) Explain encryption methods.

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

- WD1 Perform Technical Analysis
- WD2 Perform Web Programming
- WD3 Develop, Deliver, and Manage Content
- WD8 Develop and Implement Web Database

Course Name: Web Server

Course Abbreviation: IST 2483

Classification: Technical Elective (Computer Networking)

Description: This course introduces students to Web, e-mail, and proxy servers and the platforms on which they reside. Students will be able to install and configure Web, e-mail, and proxy servers (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: IT Foundations (IST 1124) or Operating Platforms (CPT 1333) and Systems Maintenance (CNT 2423/CPT 2383); Fundamentals of Data Communication (IST 1134)

Competencies and Suggested Objectives
1. Select, install, and configure Web, e-mail, and proxy servers. ^{DOK3, WDI, WD4, WD5, WD6, WD7} a. Install a network server operating system. (1) Compare the advantages and disadvantages of current net server operating system. (2) Install and configure a network service operating system. (3) Install and configure protocols. (4) Set up user accounts. (5) Set up domains (DNS). (6) Implement network security procedures. b. Configure user network management, security, and permissions. c. Use Internet services (FTP, SSH, etc.). d. Install Web server components. (1) Compare advantages and disadvantages of current Web server applications. (2) Discuss Web server and platform dependence. (3) Discuss e-commerce issues (i.e., security, catalogs, shopping carts, and database directories). (4) Discuss aliases and virtual directories. (5) Install and name a Web server. (6) Configure a Web server to host Web sites. (7) Configure an ODBC connection. (8) Configure Web server security features. (9) Analyze Web server performance. (10) Configure a proxy server. e. Explore e-mail servers. (1) Discuss e-mail server software. (2) Install e-mail server software. (3) Configure SMTP. (4) Configure POP3. (5) Discuss and configure Web mail.

STANDARDS

NWCET Skill Standards for Information Technology—Web Development and Administration

- WD1 Perform Technical Analysis
- WD4 Implement and Maintain Site and Applications
- WD5 Manage Web Environment
- WD6 Manage Enterprise-wide Web Activities
- WD7 Perform Testing and Quality Assurance

Database Administration Technology Courses

Course Name: SQL Programming

Course Abbreviation: IST 1513

Classification: AOC Core (Database Administration); Programming Elective

Description: This course is the first of a two-part series that offers students an extensive introduction to data server technology, covering the concepts of both relational and object relational databases and the structured query language (SQL). Students are taught to retrieve data and produce readable output. (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Write basic SQL statements.	DOK2, DA2, DA3
a. Explore the capabilities of SQL SELECT statements. b. Execute basic SELECT statements. c. Use tools that recognize and submit SQL statements for processing.	
2. Restrict and sort data.	DOK2, DA2
a. Limit the rows retrieved by a query. b. Sort the rows retrieved by a query.	
3. Use single-row functions.	DOK2, DA2, DA3
a. Describe the various types of functions available in SQL. b. Use character, number, and date functions in SELECT statements. c. Demonstrate the use of conversion functions and conditional expressions. d. Use comparison operators and logical operators. e. Use range conditions, membership conditions, and pattern matching. f. Discuss rules of precedence.	
4. Display data from multiple tables.	DOK2, DA2
a. Write SELECT statements to access data from more than one table. b. Describe the Cartesian product. c. Compare and use types of joins.	
5. Aggregate data using group functions.	DOK2, DA2
a. Identify the available group functions. b. Discuss the uses of group functions. c. Demonstrate the grouping of data and include or exclude grouped rows.	
6. Write subqueries.	DOK3, DA2
a. Identify the types of problems that subqueries can solve. b. Describe subqueries. c. List the types of subqueries. d. Write single-row and multiple-row subqueries.	

7. Produce readable output. ^{DOK3, DA2, DA3}
- a. Produce queries requiring an input variable.
 - b. Use tools to control environmental settings.
 - c. Create and execute script files.

STANDARDS

NWCET Skill Standards for Information Technology—Database Development and Administration

DA2 Develop and Implement Database

DA3 Perform Administration and Maintenance

Course Name: Advanced SQL Programming

Course Abbreviation: IST 1523

Classification: AOC Core (Database Administration); Programming Elective

Description: This course is the second of a two-part series that offers students an extensive introduction to data server technology. Students are taught advanced concepts of both relational and object relational databases and the structured query language (SQL). Students are taught to create and maintain database objects, manipulate data, and control user access (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: SQL Programming (IST 1513)

Competencies and Suggested Objectives	
1. Use set operators.	^{DOK2, DA1}
a. Discuss set operator guidelines.	
b. Use the UNION, INTERSECT, and UNION ALL operators.	
2. Manipulate data in the database.	^{DOK2, DA1, DA2, DA4}
a. Describe data manipulation commands.	
b. Insert rows into a table, update rows in a table, and delete rows from a table.	
c. Control database transactions.	
d. Discuss and implement read consistency.	
3. Create and manage tables.	^{DOK2, DA1, DA2, DA4}
a. Create tables.	
b. Describe the data types that can be used when specifying column definitions.	
c. Alter table definitions.	
d. Delete, rename, and truncate tables.	
4. Use constraints.	^{DOK2, DA1, DA2}
a. Describe constraints.	
b. Create and maintain constraints.	
5. Create views.	^{DOK2, DA1, DA2}
a. Describe views and their uses.	
b. Demonstrate how to create and delete a view.	
c. Retrieve data through a view.	
d. Alter the definition of a view.	
e. Insert, update, and delete data through a view.	
f. Discuss inline views.	
6. Use other database objects in SQL.	^{DOK2, DA1, DA2, DA4}
a. Manage database objects using a data dictionary.	
b. Create, maintain, and delete sequences.	
c. Create, maintain, and delete indexes.	
d. Create and delete private and public synonyms.	
7. Control user access.	^{DOK2, DA1, DA2, DA4}
a. Analyze the concepts of users and their roles and privileges.	
b. Practice creating users.	

- c. Grant and revoke privileges.
- d. Create roles and grant privileges to roles.
- e. Change user passwords.

STANDARDS

NWCET Skill Standards for Information Technology—Database Development and Administration

- DA1 Analyze and Design Database
- DA2 Develop and Implement Database
- DA4 Provide Data Assurance

Course Name: Database Architecture and Administration

Course Abbreviation: IST 1534

Classification: AOC Core (Database Administration)

Description: This course is the first of a two-part series designed to give students a firm foundation in basic database tasks enabling them to install, create, and maintain a database. Students will gain a conceptual understanding of database architecture and how its components work and interact with one another. Students will also learn how to create an operational database and properly manage the various structures (4 sch: 3-hr lecture, 2-hr lab).

Prerequisite: SQL Programming (IST 1513)

Corequisite: Advanced SQL Programming (IST 1523)

Competencies and Suggested Objectives	
1. Illustrate and examine the architectural components of a database.	DOK1, DA1
a. Describe the server architecture and its main components.	
b. List the structures involved in connecting a user to the database.	
c. Identify the stages in processing SQL queries and DML statements.	
2. Discuss how to install database software.	DOK1, DA1
3. Explain how to create a database.	DOK1, DA1
4. Manage a database connection.	DOK2, DA1, DA2, DA3
a. Create, manage, and use initialization files.	
b. Identify the various states of starting a database.	
c. Discuss the various options available to shut down a database.	
5. Demonstrate how to retrieve information about the database and its users.	DOK2, DA1, DA2, DA3
6. Use software tools to configure and manage the network environment for the database.	DOK2, DA1, DA2, DA3
a. Establish database connections.	
b. Test connectivity.	
7. Manage database storage structures.	DOK2, DA1, DA2, DA3
a. Discuss how table data is stored.	
b. Maintain tables using appropriate storage settings.	
8. Administer user security.	DOK2, DA1, DA2, DA3, DA4
a. Create and manage database user accounts.	
b. Discuss password management and resources management.	
c. Grant and revoke database privileges.	
d. Create and manage roles and profiles.	
9. Manage data and concurrency.	DOK3, DA1, DA2, DA3, DA4
a. Manipulate data using insert, update, and delete commands.	
b. Monitor and resolve locking conflicts.	
10. Implement and maintain data integrity constraints.	DOK2, DA1, DA2, DA3, DA4

STANDARDS

NWCET Skill Standards for Information Technology—Database Development and Administration

- DA1 Analyze and Design Database
- DA2 Develop and Implement Database
- DA3 Perform Administration and Maintenance
- DA4 Provide Data Assurance

Course Name: Advanced Database Architecture and Administration

Course Abbreviation: IST 2514

Classification: AOC Core (Database Administration)

Description: This course is a continuation of Database Architecture and Administration. It is designed to provide a firm foundation in basic database tasks, enabling students to design, create, and maintain a database. Students will gain a conceptual understanding of database architecture and how its components work and interact with one another. Students will also learn how to create an operational database and properly manage the various structures (4 sch: 3-hr lecture, 2-hr lab).

Prerequisite: Database Architecture and Administration (IST 1534)

Competencies and Suggested Objectives	
1. Manage “undo” data.	DOK2, DA1
a. Describe “undo” data.	
b. Understand transactions as they relate to “undo” data.	
2. Implement database security.	DOK2, DA1, DA2, DA3, DA4
a. Describe database security.	
b. Use standard database auditing.	
3. Perform database maintenance.	DOK2, DA1, DA2, DA3, DA4
a. Gather and manage statistics.	
b. Manage alert notifications and set thresholds.	
4. Discuss performance management.	DOK1, DA1, DA3, DA4
5. Discuss backup and recovery concepts.	DOK2, DA1, DA3, DA4
a. Identify the types of failures that can occur in a database.	
b. Identify the importance of checkpoints, redo log files, and archived log files.	
c. Create and manage database backups.	
d. Perform database recovery.	
6. Describe and use methods to move data.	DOK2, DA1, DA3

STANDARDS

NWCET Skill Standards for Information Technology—Database Development and Administration

- DA1 Analyze and Design Database
- DA2 Develop and Implement Database
- DA3 Perform Administration and Maintenance
- DA4 Provide Data Assurance

Course Name: Linux Operating System Fundamentals

Course Abbreviation: IST 2524

Classification: AOC Core (Database Administration)

Description: In this course, students develop proficiency in using and customizing a Linux operating system for common command line processes and desktop productivity roles (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: IT Foundations (IST 1124) or Operating Platforms (CPT 1333) and Systems Maintenance (CNT 2423/CPT 2383)

Competencies and Suggested Objectives	
1. Navigate and use the Linux file and directory system.	DOK2, ND1, ND3, ND5, ND6
a. Identify the components of the Linux User Interface.	
b. Explain the Linux file system.	
c. Use Linux commands.	
d. Manipulate files and directories.	
2. Manage users, groups, and system information.	DOK1, ND1, ND3, ND5, ND6
a. Identify types of users and groups.	
b. Identify various user and system information commands.	
3. Implement file and directory access permissions.	DOK2, ND1, ND5, ND6
a. Change file access permissions.	
b. Allocate access permissions.	
4. Use the vi editor for editing text.	DOK2, ND1, ND5, ND6
a. Create and edit files with the vi editor.	
b. Use vi commands for editing text.	
5. Discuss shells and environment variables.	DOK1, ND1, ND5, ND6

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND3 Configure and Deploy Network
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth

Course Name: IT Project Management

Course Abbreviation: IST 2534

Classification: Technical Elective

Description: In this course, students develop proficiency in using and customizing a project timeline for IT implementation. (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: IT Foundations (IST 1124) or Operating Platforms (CPT 1333) and Systems Maintenance (CNT 2423/CPT 2383)

Competencies and Suggested Objectives	
1. Explain the need for project management within IT.	DOK1, PM1
a. Describe the attributes of a project and project management.	
b. Describe the role of a project manager.	
2. Outline a project life cycle.	DOK1, PM1, PM2, PM3, PM4, PM5
a. Explain project development and product development.	
b. Outline project phases.	
c. Explain the system view of a project.	
3. Demonstrate project scope management.	DOK3, PM1
a. Plan the scope of a project.	
b. Define the scope of a project.	
4. Demonstrate project time management.	DOK3, PM2, PM3, PM4, PM5, PM6, PM7, PM8, PM9, PM10, PM11
a. Develop project schedules.	
b. Evaluate available resources needed to recommend a project schedule.	
5. Demonstrate project cost management.	DOK3, PM1, PM2, PM3, PM4, PM5, PM6, PM7, PM8, PM9, PM10, PM11, PM12, PM13, PM14, PM15
a. Differentiate various types of cost estimates.	
b. Use project management software to assist in project cost management.	

STANDARDS

NWCET Skill Standards for Information Technology—Project Management

- PM1 Define scope of project.
- PM2 Identify stakeholders, decision makers, and escalation procedures.
- PM3 Develop detailed task list (work breakdown structures).
- PM4 Estimate time requirements.
- PM5 Develop initial project management flowchart.
- PM6 Identify required resources and budget.
- PM7 Evaluate project requirements.
- PM8 Identify and evaluate risks.
- PM10 Identify interdependencies.
- PM11 Identify and track critical milestones.
- PM12 Participate in project phase review.
- PM15 Report project status.

Course Name: Principles of Database Management

Course Abbreviation: IST 1173

Classification: Database Elective

Description: This course is designed to give students a firm foundation in basic database tasks, enabling them to design, create, and maintain a small-scale database. Students will gain a conceptual understanding of database architecture and how its components work and interact with one another. Students will also learn how to create an operational database and properly manage the various structures. (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Manipulate database files and format documents and reports.	DOK3, DA2, DA3
a. Design and create a database using specific criteria. (i) Open objects in multiple views. (ii) Move among records. (iii) Create and modify tables. (iv) Create lookup fields and modify field properties. b. Modify database structure and records to produce desired output. (i) Create and modify queries. (ii) Enter, edit, sort, filter, and delete records. c. Define and create relationships, enforcing referential integrity. d. Design, create, and format reports. e. Design, create, and format forms. f. Import data from spreadsheets, text files, and other databases. g. Perform mathematical operations and relate their applications to existing information in a database.	

STANDARDS

NWCET Skill Standards for Information Technology—Database Development and Administration

DA2 Develop and Implement Database

DA3 Perform Administration and Maintenance

Network Security Technology Courses

Course Name: Computer Forensics

Course Abbreviation: IST 1613

Classification: Network Security Elective

Description: This course is an introduction to the various technical and administrative aspects of computer forensics and laws pertaining to cybercrime. This course provides the foundation for understanding the key issues associated with computer forensic investigations, understanding the boot processes and disk structure for multiple operating systems, and understanding the processes related to data acquisition during investigations (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives	
1. Describe the elements of computer crimes and cyber attacks.	DOK2, ND1, ND4
a. Identify the types of computer crimes and cyber attacks.	
b. Compare and contrast corporate and criminal investigations regarding electronic evidence (e-evidence).	
c. Discuss the role of computer forensics examiners in corporate and criminal investigations.	
2. Identify elements of the e-evidence collection.	DOK2, ND1, ND4, ND7
a. Employ industry-recognized tools, equipment, and environments for e-evidence collection and analysis.	
b. Compare and contrast acceptable procedures for e-evidence collection and analysis for corporate and criminal investigations.	
c. Assess considerations of personal data devices in e-evidence collection and analysis.	
d. Formulate proper forensic examination report.	
3. Demonstrate proper data acquisition and investigation involving computer operating systems.	DOK2, ND1, ND4, ND7
a. Classify various operating systems and file structures.	
b. Cite various operating system page file and network connection information.	
c. Explain considerations for e-mail and Web-mail.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

ND1 Perform Analysis
 ND4 Perform Testing
 ND7 Perform Security Administration

Course Name: Network Security Fundamentals

Course Abbreviation: IST 1624

Classification: AOC Core (Network Security)

Description: This course provides the fundamental understanding of network security principles, implementations, and the concepts, models, and technologies involved in creating a secure network environment. Topics include, but are not limited to, authentication, types of attacks and malicious code, and best practices for securing a network environment (4 sch: 2-hr lecture, 4-hr lab).

Prerequisites: Fundamentals of Data Communication (IST 1134); Security Principles and Policies (IST 1143)

Competencies and Suggested Objectives	
1. Interpret general security concepts.	DOK2, NDI, ND2, ND3, ND4, ND5, ND6
a. Discuss and explain the access control models (mandatory, discretionary, and role-based). b. Explain authentication methods and technologies including kerberos, CHAP, certificates, username/password, tokens, multi-factor, mutual, and biometric. c. Differentiate between essential and nonessential services and protocols based on various operational environments. d. Differentiate various types of cyber attacks and identify appropriate strategies for defense. e. Discuss malicious code and appropriate strategies to reduce risk to systems.	
2. Recognize the importance of operational and organizational security.	DOK1, NDI, ND2, ND3, ND4, ND5, ND6
a. Analyze the significance of physical security to information security. b. Discuss the security implications of disaster recovery and business continuity. c. Discuss the proper implementation and use of policies and procedures. d. Explain the concepts of privilege management. e. Discuss the security relevance of the education and training of end users, executives, and human resources. f. Recognize various social engineering techniques and effective security strategies to deter successful social engineering attacks.	
3. Describe the elements of communication security.	DOK1, NDI, ND2, ND3, ND4, ND5, ND6
a. Explain the administration and vulnerabilities of current remote access technologies. b. Discuss current e-mail security technologies and vulnerabilities. c. Explain the administration of Internet security concepts, including Web content, wireless technologies, instant messaging, and vulnerabilities. d. Discuss the administration of file transfer protocols and concepts.	
4. Describe the elements of infrastructure security.	DOK2, NDI, ND2, ND3
a. Discuss the security concerns of network devices. b. Explain the security concerns of various types of digital communication media. c. Discuss current security topologies.	

d. Differentiate types of intrusion detection systems.	
e. Discuss the concepts of security baselines and operating system and network hardening.	
5. Summarize cryptography standards.	DOK2, ND1, ND2, ND3
a. Explain hashing, symmetric, and asymmetric cryptographic algorithms.	
b. Differentiate the various cryptographic standards and protocols.	
c. Describe the concepts of public key infrastructure.	
d. Discuss and explain the concepts of key management and certificate lifecycles.	
6. Recognize domestic and international law regarding security.	DOK1, ND1, ND2, ND3, ND4, ND5, ND6
a. Identify restrictions on import and export of encryption technologies.	
b. Discuss domestic and international law on apprehension and prosecution of cyber criminals.	
c. Explain the concept of digital rights management.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth

Course Name: Wireless Security and Privacy

Course Abbreviation: IST 1633

Classification: AOC Core (Network Security)

Description: This course provides a fundamental understanding of wireless architecture, security principles, and the technologies and principles involved in creating a secure wireless computer network environment. Topics include wireless hardware, protocols, encryption, and how to prevent weaknesses in wireless technology (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: Fundamentals of Data Communication (IST 1134); Security Principles and Policies (IST 1143)

Competencies and Suggested Objectives	
1. Define wireless network concepts.	DOK2, ND1
a. Discuss the variations of applications and tools used in wireless networks.	
b. Compare and contrast traditional network media with wireless network media.	
c. Interpret wireless technology acronyms.	
2. Discuss and differentiate wireless network technologies.	DOK2, ND1, ND2
a. Identify the components of wireless network technologies.	
b. Differentiate wireless topologies.	
c. Analyze wireless challenges and issues.	
d. Discuss radio frequency fundamentals.	
e. Explain spread spectrum technology.	
3. Assess various attacks on wireless networks.	DOK1, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Explain the application of wireless encryption standards.	
b. Identify security weaknesses in wireless networking technologies.	
c. Describe best practices for securing wireless networks.	
4. Implement a wireless network solution.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Install and configure a wireless access point.	
b. Install and configure a wireless NIC.	
c. Implement a wireless encryption solution.	
d. Implement best practices in security and wireless network.	
5. Discuss a wireless antenna.	DOK2, ND1, ND4, ND5, ND6, ND7
a. Explain and demonstrate directional antennas.	
b. Explain and demonstrate omni-directional antennas.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing

- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Network Defense and Countermeasures

Course Abbreviation: IST 1643

Classification: AOC Core (Network Security)

Description: This course provides a solid foundation of network security and the understanding of the process to create a network defense and countermeasure policy to respond to intrusion detection. Topics include network address translation, packet filtering, proxy servers, firewalls, and virtual private networks used to design a network defense strategy (3 sch: 2-hr lecture, 2- hr lab).

Prerequisites: Network Security Fundamentals (IST 1623); Fundamentals of Data Communication (IST 1134)

Competencies and Suggested Objectives	
1. Summarize network security principles.	DOK1, ND1, ND7
a. Define information security and its components.	
b. Explain the various types of attacks and threats.	
c. Analyze the goals of information security services.	
d. Interpret the concept of layering as it applies to network defense technology.	
2. Apply risk management concepts.	DOK2, ND1, ND4, ND7
a. Perform risk assessments.	
b. Apply security policy implementation as a tool for risk management.	
3. Explain intrusion detection systems.	DOK2, ND1, ND2, ND3, ND4, ND7
a. Analyze network traffic to determine a baseline of legitimate network traffic.	
b. Differentiate legitimate network traffic from suspicious events.	
c. Evaluate available intrusion detection systems.	
d. Develop an appropriate security incident response team.	
e. Identify the steps for incident response.	
4. Explain virtual private network (VPN) concepts.	DOK1, ND1, ND2, ND3
a. Describe VPN activities.	
b. Describe the advantages and disadvantages of VPNs.	
c. Identify the steps in designing and configuring a VPN.	
5. Describe firewall technologies.	DOK2, ND1, ND2, ND3, ND4, ND7
a. Differentiate various firewall configurations.	
b. Formulate an appropriate firewall rule set based on various operations environments.	
c. Identify various firewall topologies.	
d. Discuss authentication considerations as they apply to firewalls.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

ND1 Perform Analysis
ND2 Design Network

ND3 Configure and Deploy Network
ND4 Perform Testing
ND7 Perform Security Administration

Course Name: Windows Security

Course Abbreviation: IST 2613

Classification: AOC Core (Network Security)

Description: This course provides the knowledge and fundamental understanding of Windows security, how to harden current Windows operating systems, and how to defend against attacks. Topics include designing Active Directory, authentication for Windows, group security and policy, service security, remote access security, planning a public key infrastructure, securing file resources, Internet Protocol Security, and additional Windows security topics (3 sch: 2-hr lecture, 2-hr lab).

Prerequisites: Network Security Fundamentals (IST 1624); Network Administration Using Microsoft Windows Server (IST 1244)

Competencies and Suggested Objectives	
1. Plan and configure an authentication strategy.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Define the components of an authentication model. b. Implement an authentication strategy for internal users and Web access. c. Create trusts.	
2. Plan and configure an authorization strategy.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Define the components of an authorization strategy to include access control lists and permissions. b. Apply group management techniques to an authorization strategy. c. Explain the concept of least privilege.	
3. Explain the use of security templates.	DOK3, ND1, ND4, ND5, ND6, ND7
a. Plan and create a security template. b. Deploy a security template with Active Directory. c. Deploy a security template without Active Directory.	
4. Employ concepts of operating system hardening.	DOK2, ND1, ND4, ND5, ND6, ND7
a. Apply operating system hardening techniques to client systems. b. Apply operating system hardening techniques to server systems. c. Apply baseline techniques to client and server systems. d. Employ tools such as Microsoft Baseline Security Analyzer.	
5. Plan for operating system update and patch management.	DOK3, ND1, ND4, ND5, ND6, ND7
a. Identify update types. b. Formulate a plan for testing and deploying updates.	
6. Install, configure, and manage certification services.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Identify public key infrastructure considerations. b. Manage certificates. c. Deploy and revoke certificates. d. Archive and recover certificates.	
7. Plan and configure IPsec.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Secure communications from host-to-host, host-to-network, and network-to-network. b. Identify Active Directory and authentication considerations of IPsec.	

c. Use tools to configure IPSec.	
d. Deploy IPSec.	
e. Monitor IPSec.	
8. Plan and configure a wireless network.	DOK3, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Design an authorization strategy for a wireless network.	
b. Configure a wireless client.	
c. Deploy WEP encryption.	
9. Deploy, configure, and manage SSL certificates.	DOK2, ND1, ND2, ND3, ND4, ND5, ND6, ND7
a. Configure SSL for IIS.	
b. Enable SSL with other applications.	
10. Identify remote access methods.	DOK2, ND1, ND2, ND3, ND4, ND5, ND6
a. Configure remote access servers and clients.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Linux/Unix Security

Course Abbreviation: IST 2623

Classification: Network Security Elective

Description: This course provides the knowledge and fundamental understating of Linux/Unix security, how to harden Linux/Unix, and how to defend against potential attacks against vulnerabilities and unused system services. Topics include how to protect password files, monitor log files, and use port scanners and network scanners, and additional Linux/Unix security topics (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: Network Security Fundamentals (IST 1624); Advanced Network Administration Using Linux (IST 2264)

Competencies and Suggested Objectives	
1. Install the Linux operating system (OS).	DOK2, NDI, ND2, ND3, ND4, ND5, ND6
a. Explain the Linux boot process.	
b. Use common Linux administration commands.	
2. Design a perimeter network.	DOK4, NDI, ND2, ND3, ND4
a. Apply the principles of security services to network design.	
b. Describe firewalls, DMZs, and the appropriate allocation of network resources.	
3. Implement security strategies with Linux OSs.	DOK2, NDI, ND2, ND3, ND4, ND5, ND6, ND7
a. Discuss and implement Linux OS hardening principles.	
b. Discuss and implement automated hardening utilities.	
c. Discuss and implement account and password policies.	
d. Analyze the appropriateness of various Linux services for different operating environments.	
4. Discuss secure communication services.	DOK1, NDI, ND4, ND5, ND6, ND7
a. Discuss secure shell.	
b. Discuss LDAP for authentication.	
5. Secure various server implementations.	DOK2, NDI, ND4, ND5, ND6, ND7
a. Implement strategies for securing database and file servers.	
b. Implement strategies for securing Web servers.	
c. Implement strategies for securing Internet e-mail.	
d. Implement strategies for securing DNS servers.	
6. Identify and analyze hacking techniques.	DOK2, NDI, ND4, ND5, ND6, ND7
a. Identify Linux system weaknesses and hacker exploits.	
b. Identify Linux remote services and default port configurations.	
c. Discuss footprinting, scanning, port redirection, and other exploits.	
7. Define intrusion detection.	DOK2, NDI, ND4, ND5, ND6, ND7
a. Explain the principles of intrusion detection systems.	
b. Identify the various components of intrusion detection systems.	
c. Use various intrusion detection utilities.	

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND2 Design Network
- ND3 Configure and Deploy Network
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Course Name: Security Testing and Implementation

Course Abbreviation: IST 2634

Classification: Network Security Elective

Description: This course provides an in-depth exploration of various methods for gaining unauthorized access to networks and explores network security concepts from the point of view of hackers and their methodologies. Topics include hackers, crackers, ethical hackers, attacks, intrusion detection systems, malicious code, computer crime, and industrial espionage (4 sch: 2-hr lecture, 4-hr lab).

Prerequisite: Network Defense and Countermeasures (IST 1643); Computer Forensics (IST 1613); any programming course

Competencies and Suggested Objectives	
1. Discuss the ethical hacker concept.	DOK2, ND1, ND4, ND5, ND6, ND7
a. Discuss the importance of security.	
b. Compare and contrast penetration testing, ethical hacking, and malicious attacks.	
c. Identify the importance of ethics and the legalities of ethical hacking and penetration testing.	
2. Identify various network and computer attacks.	DOK2, ND1, ND4, ND5, ND6, ND7
a. Analyze types of malicious software.	
b. Analyze types of attacks.	
c. Explain various hacker reconnaissance methods.	
3. Summarize malicious code types.	DOK1, ND1, ND4, ND5, ND6, ND7
a. Discuss the impact of malicious code attacks.	
b. Discuss historic and infamous malicious code attacks, response, and industry-accepted management strategies.	
c. Analyze the known types of malicious code.	
4. Discuss strategies for combating malicious code and other attacks.	DOK1, ND1, ND4, ND5, ND6, ND7
a. Discuss the optimum management mind-set for risk management of malicious code attacks.	
b. Explain the importance of security policy implementation as a tool for risk management of malicious code attacks.	
c. Explain the importance of training IT and non-IT employees as a critical tool for combating malicious code and other attacks.	
5. Classify various infection methods for malicious code.	DOK1, ND1, ND4, ND5, ND6, ND7
a. Identify known vulnerabilities for malicious code.	
b. Identify known exploits and strategies of attack for malicious code.	
c. Discuss various defensive strategies for combating malicious code attacks.	
d. Explain the importance of appropriate incident response plans.	
6. Discuss various prevention strategies and techniques for malicious code.	DOK2, ND1, ND4, ND5, ND6, ND7
a. Identify organizational considerations for preventing a malicious code attack.	

b. Identify and classify current software and hardware solutions for malicious code infection. c. Explain the policy as a tool for prevention. d. Develop an incident response plan for malicious code attacks and security violations.
7. Discuss the future of malicious code. DOK1, ND1, ND4, ND5, ND6, ND7 a. Discuss the implications of malicious code with regard to national security, homeland and infrastructure security, and information warfare. b. Discuss efforts of the government and civilian entities to combat malicious code.
8. Summarize vulnerabilities of common computer and server operating systems. DOK2, ND1, ND4, ND5, ND6, ND7 a. Analyze Microsoft operating system vulnerabilities. b. Analyze Linux operating system vulnerabilities. c. Analyze Web server vulnerabilities. d. Analyze wireless network vulnerabilities.
9. Identify various cryptographic algorithms. DOK2, ND1, ND4, ND5, ND6, ND7 a. Compare and contrast symmetric versus asymmetric cryptographic algorithms. b. Explain public key infrastructure. c. Analyze possible attacks on cryptosystems.
10. Describe network security devices. DOK1, ND1, ND4, ND5, ND6, ND7 a. Compare firewall implementations. b. Explain intrusion detection systems. c. Explain honeypots and their implementation.

STANDARDS

NWCET Skill Standards for Information Technology—Network Design and Administration

- ND1 Perform Analysis
- ND4 Perform Testing
- ND5 Manage Network
- ND6 Maintain Network and Manage Growth
- ND7 Perform Security Administration

Baseline, Service, and Related Courses

Course Name: Fundamentals of Information Technology

Course Abbreviation: IST 1113

Classification: Additional Elective

Description: This course introduces microcomputer operation, word processing, spreadsheets, database management, and online applications. It is designed for students with limited computer proficiency and is to be taken by those students in addition to the courses listed in the course sequence (3 sch: 2-hr lecture, 2-hr lab).

Prerequisite: None

Competencies and Suggested Objectives

1. Apply a basic understanding of an operating system. ^{DOK2}
 - a. Show basic commands of operating system software.
 - (1) Use proper file and disk management.
 - (2) Explore files and folders.
 - (3) Create folders.
 - (4) Copy and move files and folders.
 - b. Illustrate the use of word processing software.
 - (1) Produce a new document.
 - (2) Format text and paragraphs.
 - (3) Copy, move, and format text.
 - (4) Insert graphics.
 - c. Demonstrate the use of spreadsheet software.
 - (1) Produce a new spreadsheet.
 - (2) Set up row and column headings.
 - (3) Enter text and formulas.
 - (4) Copy, move, and format text and formulas.
 - (5) Create and modify charts.
 - d. Explore and use a database management program.
 - (1) Create a database.
 - (2) Create tables and data.
 - (3) Modify table data within the database.
 - (4) Apply reports in database.
 - (5) Query a database to extract information.
 - (6) Create and use database forms.
 - e. Illustrate the use of a presentation program.
 - (1) Create a presentation.
 - (2) Select slide layouts.
 - (3) Select a design template.
 - (4) Enter and format text on a slide.
 - (5) Insert graphics on a slide.

- (6) Show a presentation.
 - (7) Modify slide transitions and slide animation.
- f. Transfer data among applications.
 - (1) Import/export word processing text.
 - (2) Import/export database fields.
 - (3) Import/export spreadsheet data and/or charts.
- 2. Demonstrate use of the Internet. ^{DOK2}
 - a. Present an overview of the Internet.
 - (1) Explain the history of the Internet and how it works.
 - (2) Describe connecting to the Internet and Internet protocols.
 - (3) Discuss the domain name system (DNS) and uniform resource locators (URLs).
 - (4) Discuss intranets and extranets.
 - b. Browse the World Wide Web.
 - (1) Discuss Web browsers.
 - (2) View pages with an Internet browser.
 - (3) Customize the browsers.
 - c. Use FTP, newsgroups, and Telnet.
 - (1) Demonstrate and discuss FTP.
 - (2) Discuss and use newsgroups and mailing lists.
 - (3) Explain and use Telnet.
 - d. Send electronic mail.
 - (1) Explain e-mail basics.
 - (2) Send and receive e-mail.
 - (3) Discuss netiquette and privacy issues.
 - (4) Create and send e-mail signatures and attachments.
 - e. Demonstrate plug-ins and viewers.
 - (1) Discuss multimedia on the Web.
 - (2) Discuss plug-in technology.
 - (3) Download and use plug-ins and viewers.
 - f. Use search engines.
 - (1) Discuss how search engines work.
 - (2) Discuss basic and advanced search techniques.
 - (3) Search for graphics, people, and information.
 - g. Download files from the Internet.
 - (1) Describe encrypted files.
 - (2) Download and un-encrypt files.
 - h. Discuss Internet security.
 - (1) Describe, enable, disable, and delete cookies.
 - (2) Discuss sending secure data over the Web.
 - (3) Discuss authentication and digital certificates.
 - (4) Configure browser security.
 - (5) Discuss encryption.
 - (6) Discuss viruses and prevention/removal.
 - (7) Describe proxy servers and firewalls.
 - i. Explore e-commerce.
 - (1) Explain e-commerce.

- (2) Discuss the types of e-commerce.
- (3) Discuss electronic data interchange and secure electronic transactions.
- (4) Discuss e-commerce advantages, issues, and copyrights.
- (5) Present e-commerce solutions.
- j. Demonstrate Web site publishing.
 - (1) Publish a Web site onto a server.
 - (2) Discuss hosting.

Course Name: Fundamentals of Microcomputer Applications

Course Abbreviation: CPT 1113

Classification: Service course; not to be taken by Business and Office and Related Technology students

Description: This course will introduce information processing concepts, including word processing, spreadsheet, and database management software (3 sch: 2-hr lecture, 2-hr lab).

Prerequisites: None

Competencies and Suggested Objectives	
1. Discuss hardware components. ^{DOK1}	a. Describe the input, output, and storage elements of the information processing cycle, and explain each element. b. Describe and discuss the three main classifications of the computer, including micro, mid-range, and mainframes.
2. Explain classes of software. ^{DOK1}	a. Describe functions of systems software. b. Identify widely used software applications. c. Discuss various high-level languages. d. Discuss data organization.
3. Create and print mailable documents. ^{DOK2}	a. Develop keyboarding skills. b. Prepare letters using full block style. c. Use word processing software to produce documents.
4. Create and print spreadsheets. ^{DOK2}	a. Use spreadsheet software to produce acceptable worksheets. b. Generate graphs from worksheets.
5. Create and print database files. ^{DOK2}	a. Use database software to produce databases. b. Edit database records. c. Print reports.
6. Integrate application information. ^{DOK2}	a. Merge a database with a word processing letter. b. Merge a spreadsheet with a letter.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for use in this course will depend upon the nature of the problem under investigation.

Course Name: Supervised Work Experience in Information Systems Technology

Course Abbreviation: IST 291(1-6)

Classification: Technical Elective

Description: This course is a cooperative program between industry and education designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of one semester hour per 45 industrial contact hours (1-6 sch: 3- to 18-hr externship).

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in Information Systems Technology

Competencies and Suggested Objectives	
1.	Follow a set of instructor-written guidelines for the supervised work experience program.
2.	Apply skills needed to be a viable member of the workforce. - Prepare a description of skills to be developed in the supervised work experience program. - Practice skills needed to be a viable member of the workforce.
3.	Practice human relationship skills in the supervised work experience program.
4.	Practice positive work habits, responsibilities, and ethics.
5.	Develop written occupational objectives in the supervised work experience program.
6.	Assess performance of occupational skills. - Prepare daily written assessments of work performance as specified in the occupational objectives. - Present weekly written reports to the instructor of activities performed and objectives accomplished.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.

Course Name: Special Problem in Information Systems Technology

Course Abbreviation: IST 292(1–3)

Classification: Technical Elective

Description: This course provides students with an opportunity to utilize skills and knowledge gained in other Information Systems Technology courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project (1–3 sch: 2- to 6-hr lab).

Prerequisites: Consent of instructor

Competencies and Suggested Objectives	
1. Develop a written plan that details the activities and projects to be completed.	a. Use a written plan that details the activities and projects to be completed. b. Perform written occupational objectives in the special problem.
2. Assess accomplishment of objectives.	a. Prepare daily written assessments of accomplishment of objectives. b. Present weekly written reports of activities performed and objectives accomplished to the instructor.
3. Use and follow a set of written guidelines for the special problem.	a. Develop and follow a set of written guidelines for the special problem.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for use in this course will depend upon the nature of the problem under investigation.

Course Name: Work-based Learning I, II, III, IV, V, and VI

Course Abbreviation: WBL 191(1–3), WBL 192(1–3), WBL 193(1–3), WBL 291(1–3), WBL 292(1–3), and WBL 293(1–3)

Classification: Free Elective

Description: In this structured worksite learning experience, the student, program area teacher, work-based learning coordinator, and worksite supervisor/mentor develop and implement an educational training agreement. It is designed to integrate the student's academic and technical skills into a work environment. It may include regular meetings and seminars with school personnel and employers for supplemental instruction and progress reviews (1–3 sch: 3- to 9-hr externship).

Prerequisite: Concurrent enrollment in career technical program area courses

Competencies and Suggested Objectives	
1.	Apply technical skills and related academic knowledge needed to be a viable member of the workforce. - Demonstrate technical skills necessary to complete job requirements. - Demonstrate academic skills necessary to complete job requirements. - Perform tasks detailed in an educational training agreement at the work setting.
2.	Apply general workplace skills, including positive work habits necessary for successful employment. - Demonstrate appropriate human relationship skills in the work setting, including conflict resolution, team participation, leadership, negotiation, and customer/client service. - Utilize time, materials, and resource management skills. - Use critical-thinking skills such as problem solving, decision making, and reasoning. - Acquire, evaluate, organize, maintain, interpret, and communicate information.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.

Appendix A: Course References

Information Security Technology Core References

IST 1124

Andrews, J. (2009). *A+ guide to hardware: Managing, maintaining, and troubleshooting* (5th ed.). Boston, MA: Course Technology.

Andrews, J. (2009). *A+ guide to managing and maintaining your PC* (7th ed.). Boston, MA: Course Technology.

Brooks, C. J. (2004). *A+ certification core hardware*. Upper Saddle River, NJ: Prentice Hall.

Meyers, M. (2007). *A+ guide: PC technician—exams 220-602, 220-603, & 220-604*. New York, NY: McGraw-Hill.

Meyers, M. (2010). *CompTia A+ essentials: Exam 220-701*. New York, NY: McGraw-Hill.

CPT 1333

Andrews, J. (2009). *A+ guide to hardware: Managing, maintaining, and troubleshooting* (5th ed.). Boston, MA: Course Technology.

Andrews, J. (2009). *A+ guide to managing and maintaining your PC* (7th ed.). Boston, MA: Course Technology.

Brooks, C. J. (2004). *A+ certification core hardware*. Upper Saddle River, NJ: Prentice Hall.

Meyers, M. (2007). *A+ guide: PC technician—exams 220-602, 220-603, & 220-604*. New York, NY: McGraw-Hill.

Meyers, M. (2010). *CompTia A+ essentials: Exam 220-701*. New York, NY: McGraw-Hill.

CNT 2423/CPT 2383

Andrews, J. (2009). *A+ guide to hardware: Managing, maintaining, and troubleshooting* (5th ed.). Boston, MA: Course Technology.

Andrews, J. (2009). *A+ guide to managing and maintaining your PC* (7th ed.). Boston, MA: Course Technology.

Brooks, C. J. (2004). *A+ certification core hardware*. Upper Saddle River, NJ: Prentice Hall.

Meyers, M. (2007). *A+ guide: PC technician—exams 220-602, 220-603, & 220-604*. New York, NY: McGraw-Hill.

Meyers, M. (2010). *Comptia A+ essentials: Exam 220-701*. New York, NY: McGraw-Hill.

IST 1811/ IST 1821/ IST 2111/ IST 2121

Bennett, S. (2007). *That workshop book: New systems and structures for classrooms that read, write, and think*. Portsmouth, NH: Heinemann.

Newstrom, J. W., & Scannell, E. E. (1996). *The big book of business games: Icebreakers, creativity exercises, and meeting energizers*. New York, NY: McGraw-Hill.

RoAne, S. (1989). *How to work a room: Learn the strategies of savvy socializing- for business and personal success*. New York, NY: Warner Books.

IST 1134

Awe, J. (2005). 10 top dos and don'ts for your IT career. In *About.com: Computer Certification*. Retrieved October 14, 2011, from http://www.certification.about.com/cs/jobs/a/career_do_dont.htm

Reese, S. (2003). The fiber optics connection. *Techniques*, 78(8). Retrieved October 14, 2011, from <http://www.actonline.org/content.aspx?id=5870&terms=The%20fiber%20optics%20connection#Fiber>

Stallings, W. (2010). *Data and computer communications* (8th ed.). Upper Saddle River, NJ: Prentice-Hall.

Tomsho, G., Tittel, E., & Johnson, G. (2011). *Guide to networking essentials* (6th ed.). New York, NY: Thomson Learning.

White, C. (2010). *Data communications and computer networks: A business user's approach* (6th ed.). Cambridge, MA: Course Technology Thomson Learning.

IST 1143

Dimbort, D. (Executive Producer), & Chappelle, J. (Director). (2000). *Track down* [DVD]. New York, NY: Dimension Films.

Federal Bureau of Investigation. (n.d.) Retrieved October 14, 2011, from <http://www.fbi.gov/>

InfraGard. (n.d.). Retrieved October 14, 2011, from <http://www.infragard.net/>

Maiwald, E. (2004). *Fundamentals of network security*. Burr Ridge, IL: McGraw-Hill Technology Education.

U.S. Department of Justice. (n.d.). Retrieved October 14, 2011, from <http://www.usdoj.gov/>

U.S. Treasury Department. (2006). Retrieved October 14, 2011, from <http://www.ustreas.gov/uss>

IST 1154

Carey, P. (2009). *HTML and XHTML* (5th ed.). Boston, MA: Thomson.

Farrell, J. (2009). *Java programs to accompany programming logic and design* (2nd ed.). Boston, MA: Course Technology.

Farrell, J. (2010). *Programming logic and design* (6th ed.). Boston, MA: Course Technology.

Farrell, J. (2010). *An object-oriented approach to programming logic and design* (3rd ed.). Boston, MA: Course Technology.

Gaskill, D. (2007). *Web site design made easy* (3rd ed.). Englewood, CO: Morton.

ProSoft Learning Corporation. (2007). *Master CIW enterprise developer certification*. Retrieved October 14, 2011, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>

Schneider, G., & Evans, J. (2006). *The Internet: 2005 update* (5th ed.). Boston, MA: Thomson Course Technology.

Sprankle, M. (2012). *Problem solving and programming concepts* (9th ed). Upper Saddle River, NJ: Pearson Prentice Hall.

Vicarel, D. (2004). *Visual Basic.NET to accompany programming logic and design*. Boston, MA: Course Technology.

Watt, D. (2004). *Programming language and design concepts*. Indianapolis, IN: Wiley Publishing, Inc.

World Organization of Webmasters. (n.d.). Retrieved October 14, 2011, from <http://webprofessionals.org/>

WDT 1123

Carey, P. (2009). *HTML and XHTML* (5th ed.). Boston, MA: Thomson.

Farrell, J. (2009). *Java programs to accompany programming logic and design* (2nd ed.). Boston, MA: Course Technology.

Farrell, J. (2010). *Programming logic and design* (6th ed.). Boston, MA: Course Technology.

- Farrell, J. (2010). *An object-oriented approach to programming logic and design* (3rd ed.). Boston, MA: Course Technology.
- Gaskill, D. (2007). *Web site design made easy* (3rd ed.). Englewood, CO: Morton.
- ProSoft Learning Corporation. (2007). *Master CIW enterprise developer certification*. Retrieved October 14, 2011, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>
- Schneider, G., & Evans, J. (2006). *The Internet: 2005 update* (5th ed.). Boston, MA: Thomson Course Technology.
- Sprankle, M. (2012). *Problem solving and programming concepts* (9th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Vicarel, D. (2004). *Visual Basic.NET to accompany programming logic and design*. Boston, MA: Course Technology.
- Watt, D. (2004). *Programming language and design concepts*. Indianapolis, IN: Wiley Publishing, Inc.
- World Organization of Webmasters. (n.d.). Retrieved October 14, 2011, from <http://webprofessionals.org/>

CPT 1143

- Carey, P. (2009). *HTML and XHTML* (5th ed.). Boston, MA: Thomson.
- Farrell, J. (2009). *Java programs to accompany programming logic and design* (2nd ed.). Boston, MA: Course Technology.
- Farrell, J. (2010). *Programming logic and design* (6th ed.). Boston, MA: Course Technology.
- Farrell, J. (2010). *An object-oriented approach to programming logic and design* (3rd ed.). Boston, MA: Course Technology.
- Gaskill, D. (2007). *Web site design made easy* (3rd ed.). Englewood, CO: Morton.
- ProSoft Learning Corporation. (2007). *Master CIW enterprise developer certification*. Retrieved October 14, 2011, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>
- Schneider, G., & Evans, J. (2006). *The Internet: 2005 update* (5th ed.). Boston, MA: Thomson Course Technology.

Sprankle, M. (2012). *Problem solving and programming concepts* (9th ed). Upper Saddle River, NJ: Pearson Prentice Hall.

Vicarel, D. (2004). *Visual Basic.NET to accompany programming logic and design*. Boston, MA: Course Technology.

Watt, D. (2004). *Programming language and design concepts*. Indianapolis, IN: Wiley Publishing, Inc.

World Organization of Webmasters. (n.d.). Retrieved October 14, 2011, from <http://webprofessionals.org/>

IST 1163

Beaulieu, A. (2009). *Learning SQL* (2nd ed.). Sebastopol, CA: O'Reilly Media.

Chapple, M. (2008). Too many reports and queries in access. In *About.com: Databases*. Retrieved October 17, 2011, from <http://databases.about.com>

MySQL. (2005). Retrieved October 17, 2011, from <http://www.mysql.com>

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Oracle Technology Network. (n.d.). Retrieved October 17, 2011, from <http://www.oracle.com/technetwork/index.html>

Patrick, J. (2008). *SQL fundamentals* (3rd ed). Upper Saddle River, NJ: Prentice Hall.

Pratt, P. & Adamski, J. (2011). *Concepts of database management* (7th ed.). Boston, MA: Course Technology.

Computer Networking Technology References

IST 1213

Barker, G., & Bogue, R. (2002). *MCSE Windows XP Professional*. Indianapolis, IN: Que.

Donald, L., & Chellis, J. (2005). *MCSA/MCSE Windows XP Professional*. San Francisco, CA: Sybex.

Stewart, J. M. (2005). *MCSE guide to Microsoft Windows XP Professional* (2nd ed.). New York, NY: Thomson Course Technology.

IST 1223

- Fitzgerald, J., & Dennis, A. (2011). *Business data communications and networking*. New York, NY: John Wiley Technology.
- Jorgenson, L. (2012). Network monitoring—best practices. In *Networking Tips: Tips and Newsletters Topics*. Retrieved May 30, 2012, from http://searchnetworking.techtarget.com/tip/1,289483,sid7_gci921245,00.html
- Odom, W. (2004). *Computer networking first-step*. Indianapolis, IN: Cisco Press.
- Reese, S. (2003). The fiber optics connection. *Techniques*, 78(8). Retrieved May 30, 2012, from <https://www.acteonline.org/content.aspx?id=5870&terms=The%20fiber%20optics%20connection.%20#Fiber>
- Verity, B. (2003). *Guide to network cabling fundamentals*. New York, NY: Thomson Learning.

IST 1234

- Clarke, D. J. (2004). *CNA study guide for NetWare 6*. New York, NY: Novell Press.
- Clarke, D. J. (2005). *CNE for NetWare 6 study guide*. New York, NY: Novell Press.
- Simpson, T. (2004). *Hands-on Novell Netware 6.0*. Boston, MA: Course Technology.
- Simpson, T. L., & Simpson, M. T. (2004). *Guide to Novell Netware 6.0 administration*. Boston, MA: Course Technology.

IST 1244

- Donald, L. & Chellis, J. (2006). *MCSA/MCSE Windows Server 2003 environment: Management and maintenance*. San Francisco, CA: Sybex.
- Laudon, K. C., Hill, B., & Pickering R. L. (2004). *Managing and maintaining a Microsoft Windows Server 2003 environment*. Upper Saddle River, NJ: Prentice Hall.
- Suehring, S., Sheltz, M., & Chellis, J. (2006). *MCSA/MCSE: Windows Server 2003 network infrastructure, implementation, management and maintenance study guide*. Hoboken, NJ: Wiley Pub.

IST 1254

- Barrett, Daniel J. (2004). *Linux pocket guide*. Sebastopol, CA: O'Reilly Media.
- Garrels, M. (2008). *Introduction to Linux: A hands on guide*. Retrieved May 19, 2008, from <http://www.tldp.org/LDP/intro-linux/html/index.html>

Regan, P. (2003). *LINUX*. Upper Saddle River, NY: Pearson Prentice Hall.

Sheer, P. (2001). *Linux: Rute user's tutorial and exposition*. Upper Saddle River, NY: Pearson Prentice Hall.

Wirzenius, L., Oja, J., Stafford, S., & Weeks, A. (2003). *The Linux system administrator's guide*. Retrieved May 30, 2012, from <http://www.tldp.org/LDP/sag/html/index.html>

IST 2213

Ciampa, M. (2008). *Security+ guide to networking security fundamentals* (3rd ed.). Boston, MA: Course Technology.

Fadia, A. (2005). *The unofficial guide to ethical hacking*. Boston, MA: Course Technology.

Lockhart, A. (2006). *Network security hacks*. Sebastopol, CA: O'Reilly Media.

Palmer, M. (2003). *Guide to operating systems security*. Boston, MA: Course Technology.

Regan, P. (2004). *Acing the Security+ certification exam*. Upper Saddle River, NY: Pearson Prentice Hall.

SecurityFocus. (n.d.). Retrieved May 30, 2012, from <http://www.securityfocus.com/>

Tanase, M. (2002). *Sniffers: What they are and how to protect yourself*. Retrieved May 30, 2012, from <http://www.symantec.com/connect/articles/sniffers-what-they-are-and-how-protect-yourself>

IST 2224

CCNA 3 and 4 companion guide (3rd ed.). (2003). Indianapolis, IN: Cisco Press.

Jorgenson, L. (2007). Network monitoring—best practices. In *Networking Tips: Tips and Newsletters Topics*. Retrieved May 30, 2012, from <http://searchnetworking.techtarget.com/tip/Network-monitoring-Best-practices>

Oppenheimer, P. (2010). *Top-down network design* (3rd ed.). Indianapolis, IN: Cisco Press.

Tanenbaum, A. S., & Wetherall, D. (2011). *Computer networks*. Boston, MA: Pearson Prentice Hall.

IST 2234

CCNA 3 and 4 companion guide (3rd ed.). (2003). Indianapolis, IN: Cisco Press.

Jorgenson, L. (2007). Network monitoring—best practices. In *Networking Tips: Tips and Newsletters Topics*. Retrieved May 30, 2012, from <http://searchnetworking.techtarget.com/tip/Network-monitoring-Best-practices>

Tanenbaum, A. S., & Wetherall, D. (2011). *Computer networks*. Boston, MA: Pearson Prentice Hall.

IST 2244

Clarke, D. J. (2004). *CNA study guide for NetWare 6*. New York, NY: Novell Press.

Clarke, D. J. (2005). *CNE for NetWare 6 study guide*. New York, NY: Novell Press.

Harris, J. L. (2003). *Novell Netware 6.5 administrator's handbook*. New York, NY: Novell Press.

Simpson, T. (2004). *Hands-on Novell Netware 6.0*. Boston, MA: Course Technology.

Simpson, T. L., & Simpson, M. T. (2004). *Guide to Novell Netware 6.0 administration*. Boston, MA: Course Technology.

IST 2254

Donald, L. & Chellis, J. (2006). *MCSA/MCSE Windows Server 2003 environment: Management and maintenance*. San Francisco, CA: Sybex.

IST 2264

Barrett, D. J. (2004). *Linux pocket guide*. Sebastopol, CA: O'Reilly Media.

Lockhart, A. (2006). *Network security hacks*. Sebastopol, CA: O'Reilly Media.

Salzman, P. J., Burian, M., & Pomerantz, O. (2009). *The Linux Kernel Module programming guide*. America: CreateSpace.

Smith, R. (2002). *Advanced Linux networking*. Upper Saddle River, NJ: Addison-Wesley Professional.

Computer Programming Technology References

IST 1314

Bradley, J. C., & Millspaugh, A. C. (2010). *Programming in Visual Basic 2010*. New York, NY: McGraw-Hill.

Hoisington, S. (2009). *Microsoft Visual Basic 2008: Comprehensive concepts and techniques*.

Hoisington, S. (2011). *Microsoft Visual Basic 2010 for Windows, Web, and office applications: Complete*.

CPT 1323

Internet Society. (n.d.). Retrieved October 17, 2011, from <http://www.isoc.org/>

Shelly, G. B., Cashman, T. J., & Vermaat, M. (2010). *Microsoft Office 2007: Introductory concepts and techniques*. Boston, MA: Thomson Course Technology.

Townsend, K. (2011). *Skills for success with Microsoft Office 2010*. Upper Saddle River, NJ: Pearson.

IST 1324

Battish, V. (2000). *Understanding CODE/400 on the AS400*. Big Sandy, TX: MC Press.

Cozzi, R. (2008). *The modern RPG IV language*. Lewisville, TX: MC Press.

McCall, M. (2000). *The AS/400 programmer's handbook, Volume II*. Big Sandy, TX: MC Press.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Yaeger, J. (1995). *Programming in RPG/400*. (2nd ed.). Loveland, CO: 29th Street Press.

IST 1334

Compinfo—The computer information center. (n.d.). Retrieved October 17, 2011, from <http://www.compinfo-center.com/apps/cobol.htm>

Murach, M. (n.d.). *The future of COBOL*. Retrieved October 17, 2011, from <http://www.infogoal.com/cbd/cbdz040.htm>

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Reeves, R. D. (2002). *COBOL programming using the .NET framework*. Upper Saddle River, NJ: Pearson Prentice Hall.

Stern, N. B., Stern, R. A., & Ley, J. P. (2006). *COBOL for the 21st century*. Hoboken, NJ: John Wiley & Sons.

IST 1483

Khnasar, E. (2009). *VCP exam cram: VMware certified professional*. Upper Saddle River, New Jersey: Pearson.

Lowe, S. (2011). *Mastering VMware vSphere 5*. Somerset, New Jersey: Wiley Publishing.

Simpson, T., & Novak, J. (2010). *Hands-on virtual computing*. Florence, KY: Cengage Publishing.

VMware workstation user's manual. (2010). Retrieved September 14, 2011, from http://www.vmware.com/pdf/ws71_manual.pdf

IST 1714

Shelly, G. B. (2006). *Java programming: complete concepts and techniques*. Boston, MA: Thomson Course Technology.

Gamelan.com. (n.d.). Retrieved October 17, 2011, from <http://www.developer.com/java>

Hall, M. (n.d.). *Java programming resources*. Retrieved October 17, 2011, from <http://www.apl.jhu.edu/~hall/java>

Harold, E. (1997). *Java secrets*. Foster City, CA: IDG Books.

Lambert, K., & Osborne, M. (2003). *Java basics*. Boston: Thomson Course Technology.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Savitch, W. J., & Mock, K. (2012). *Java: an introduction to problem solving & programming*. Boston, MA: Pearson Education, Inc.

IST 2314

Burd, S., Jackson, R., & Satzinger, J. (2005). *Object-oriented analysis and design with the unified process*. Boston, MA: Course Technology.

Cashman, T., Rosenblatt, H., & Shelly, G. (2011). *Systems analysis and design*. Boston, MA: Course Technology.

Hoffer, J., George, J., & Valacich, J. (2004). *Essentials of systems analysis & design*. Upper Saddle River, NJ: Pearson Prentice Hall.

Linger, R., Lipson, H., McHugh, J., Mead, N., & Sledge, C. (2002). *Life-cycle models for survivable systems* (CMU/SEI-2002-TR-026). Retrieved April 1, 2005, from <http://www.cert.org/archive/pdf/02tr026.pdf>

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Satzinger, J. W., Jackson, R. B., & Burd, S. D. (2009). *Systems analysis and design in a changing world*. Boston, MA: Course Technology.

Sauter, V. L. (2008). *Systems analysis Web sites*. Retrieved October 17, 2011, from University of Missouri - St. Louis course Web site for Information Systems Analysis: http://www.umsl.edu/~sauter/analysis/analysis_links.html

IST 2324

Carey, P., & Canovatchel, F. (2006). *New perspectives on JavaScript: Comprehensive*. Boston, MA: Thomson Course Technology.

Estrella, S. G. (2002). *The Web wizard's guide to JavaScript*. Upper Saddle River, NJ: Pearson.

Gosselin, D. (2010). *ASP.NET programming with C# & SQL Server*. Boston, MA: Course Technology/Cengage Learning.

Gosselin, D. (2011). *Javascript*. Boston, MA: Course Technology.

Lash, D. A. (2003). *The Web wizard's guide to PHP*. Upper Saddle River, NJ: Pearson.

Meloni, J. (2004). *PHP 5 fast & easy Web development*. Boston, MA: Course Technology.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Negrino, T., & Smith, D. (2004). *JavaScript for the World Wide Web*. Berkeley, CA: Peachpit Press.

ProSoft Learning Corporation. (n.d.). *Master CIW enterprise developer certification*. Retrieved October 17, 2011, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>

Welling, L., & Thomson, L. (2008). *PHP and MySQL Web development*. Indianapolis, IN: Sams.

IST 2334

Bradley, J. C., & Millspaugh, A. C. (2003). *Advanced programming using Visual Basic.NET*. New York, NY: McGraw-Hill.

Bradley, J. C., & Millspaugh, A. C. (2006). *Programming in Visual Basic.NET*. Boston, MA: McGraw-Hill/Irwin..

Ekedahl, M. (2004). *Advanced guide to programming with Microsoft Visual Basic.NET*. Boston, MA: Course Technology.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Spear, B. (2004). *Advanced programming with Microsoft Visual Basic.net: A case-based approach*. Boston, MA: Course Technology.

IST 2344

Kinser, A. (2012). *Microsoft Access 2010: comprehensive*. Boston, MA: Pearson.

Bagui, S., & Earp, R. (2004). *Learning SQL: A step-by-step guide using Access*. Upper Saddle River, NJ: Pearson Education.

Bradley, J. C., & Millspaugh, A. C. (2003). *Advanced programming using Visual Basic.NET*. New York, NY: McGraw-Hill.

Harris, A. (2004). *PHP5/MySQL programming for the absolute beginner*. Boston, MA: Course Technology.

McManus, J. P., & Goldstein, J. (2003). *Database access with Visual Basic.NET* (3rd ed.). Boston, MA: Pearson Education.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Welling, L., & Thomson, L. (2008). *PHP and MySQL Web development*. Upper Saddle River, NJ: Addison-Wesley.

IST 2354

IBM RPG. (n.d.). Retrieved October 17, 2011, from Wikipedia: http://en.wikipedia.org/wiki/Report_Program_Generator

Meyers, B., & Buck, J. (2010). *Programming in RPG IV*. Lewisville, TX: MC Press.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

IST 2364

Brown, G. D. (1999). *Advanced COBOL for structured and object-oriented programming*. New York, NY: Wiley.

Grauer, R. T., Vazquez, V. C., & Buss, A. R. (2000). *COBOL: From micro to mainframe: Preparing for the new millennium*. Upper Saddle River, NJ: Prentice Hall.

Cashman, T. J., Foreman, R. O., & Shelly, G. B. (2000). *Structured COBOL programming*. Boston, MA: Course Technology.

Compinfo—The computer information center. (n.d.). Retrieved October 17, 2011, from <http://www.compinfo-center.com/apps/cobol.htm>

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Nancy, S. (2007). *Cobol for the 21st century*. Indianapolis, IN: John Wiley & Sons.

IST 2374

Cprogramming.com (n.d.). *Your resource for C and C++*. Retrieved October 17, 2011, from <http://www.cprogramming.com/>

Farrell, J. (2009). *Object-oriented programming using C++*. Australia: Course Technology/Cengage Learning.

How C programming works. (n.d.). In *How stuff works*. Retrieved October 17, 2011, from <http://computer.howstuffworks.com/c.htm>

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Planet source code. (n.d.). Retrieved October 17, 2011, from <http://planet-source-code.com/>

Zak, D. (2011). *An introduction to programming With C++*. Boston, MA: Course Technology.

IST 2384

Cprogramming.com (n.d.). *Your resource for C and C++*. Retrieved October 17, 2011, from <http://www.cprogramming.com/>

Farrell, J. (2009). *Object-oriented programming using C++*. Australia: Course Technology/Cengage Learning.

How C programming works. (n.d.). In *How stuff works*. Retrieved October 17, 2011, from <http://computer.howstuffworks.com/c.htm>

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Planet source code. (n.d.). Retrieved October 17, 2011, from <http://planet-source-code.com/>

Zak, D. (2011). *An introduction to programming With C++*. Boston, MA: Course Technology.

CPT 2133

Back to the basics: A five-part series on business. (2000). [DVD]. Lawrenceville, NJ: Cambridge Educational.

Career development eManual. (2003). Ontario, Canada: University of Waterloo, Career Services, Co-operative Education, and Career Services.

Communicating between cultures [DVD]. (2004). New York, NY: Insight Media.

Hanna, S. (2005). *Career by design: Communicating your way to success*. Upper Saddle River, NJ: Pearson Prentice Hall.

Levitt, J. G., & Harwood, L. (2010). *Your career: How to make it happen*. Australia: South-Western Cengage Learning.

Making a good impression: Resumes, interviews, and appearance [DVD]. (2003). New York, NY: Insight Media.

Yena, D. J. (2011). *Career directions: the path to your ideal career*. Dubuque, IA: McGraw-Hill.

IST 1414

Carey, P., & Canovatchel, F. (2010). *New perspectives on JavaScript and AJAX: Comprehensive*. Boston, MA: Course Technology/Cengage Learning.

Danks, B., & Lane, S. (2002). *JavaScript fundamentals: Academic student guide*. Phoenix, AZ: Prosoft Training.

Gaddis, T. (2008). *Starting out with Java: Early objects*. Boston, MA: Pearson/Addison Wesley.

Gosselin, D. (2011). *Javascript*. Boston, MA: Course Technology.

ProSoft Learning Corporation. (n.d.). *Master CIW enterprise developer certification*. Retrieved October 17, 2011, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>

Shafer, D., & Andrew, R. (2006). *HTML utopia: Designing without tables using CSS*. Collingwood, Australia: SitePoint Pty.

IST 1424

Kendra, E. (2009). *Adobe Illustrator Photoshop & InDesign CS4: Graphic design portfolio*. Saint Petersburg, FL: Against the Clock.

Kendra, E., & Poyssick, G. (2009). *Adobe Flash & Dreamweaver CS4: Web design portfolio*. St. Petersburg, FL: Against the Clock.

Rader, M. H. (2005). Visualizing: Conveying information graphically in a global business environment. *NBEA 2005 Yearbook*, 43, 84–99.

World Organization of Webmasters. (n.d.). Retrieved November 8, 2004, from <http://webprofessionals.org/>

CPT 2354

Fowler, S., & Stanwick, V. (2004). *Web application design handbook: Best practices for Web-based software*. San Francisco, CA: Morgan Kaufmann.

Friedlein, A. (2001). *Web project management: Delivering successful commercial Web sites*. San Francisco, CA: Morgan Kaufmann.

Goto, K., & Cotler, E. (2002). *Web redesign: Workflow that works*. Indianapolis, IN: New Riders.

World Organization of Webmasters. (n.d.). Retrieved November 8, 2004, from <http://webprofessionals.org/>

IST 2424

Brown, J. (2002). *XML document design*. Austin, TX: Prosoft Training.

Carey, P. (2007). *New perspectives on XML: Comprehensive*. Australia: Thomson/Course Technology.

Castrim E. (2001). *XML for the World Wide Web*. Berkeley, CA: Peachpit Press.

Goldfarb, C. F., & Prescod, P. (2004). *Charles F. Goldfarb's XML handbook*. Upper Saddle River, NJ: Prentice Hall PTR.

IST 2434

- Coggeshall, J. (2005). *PHP 5 unleashed*. Upper Saddle River, NJ: Prentice Hall.
- Ekedahl, M., & Gosselin, D. (2003). *The Web warrior guide to Web programming*. Boston, MA: Course Technology.
- Gosselin, D., Kokoska, D., & Easterbrooks, R. (2011). *PHP programming with MySQL*. Boston, MA: Course Technology Cengage Learning.
- Meyer, J. (2003). *Creating database Web applications with PHP and ASP*. Hingham, MA: Charles River Media.
- Scott, P. (2009). *Perl fundamentals*. Upper Saddle River, NJ: Addison-Wesley.
- Welling, L., & Thomson, L. (2008). *PHP and MySQL Web development*. Indianapolis, IN: Sams.

IST 2444

- Leasure, B., & Leasure, J. (2004). *The web warrior guide to web database technologies*. Cambridge, MA: Course Technology.
- Morrison, J., & Morrison, M. (2003). *Database-driven Web sites*. Boston, MA: Course Technology.
- Spaanjaars, I. (2010). *Beginning ASP.NET 4 in C# and VB*. Indianapolis, IN: Wiley Pub.
- World Organization of Webmasters. (n.d.). Retrieved November 8, 2004, from <http://webprofessionals.org/>
- Yank, K. (2004). *Build your own database driven Website using PHP & MySQL*. Melbourne, Victoria, Australia: SitePoint.

IST 2454

- Hillegass, Aaron, and Joe Conway. (2011). *iOS Programming: The big nerd ranch guide* (2nd ed.). Addison-Wesley.
- iOS App Programming Guide. (n.d.). In *Apple Developer*. Apple. Retrieved October 19, 2011, from <http://developer.apple.com/library/ios/>
- The Developer's Guide. (n.d.). In *Android Developers*. Google. Retrieved October 19, 2011, from <http://developer.android.com/guide/index.html>>

Windows Phone Development. (n.d.). Retrieved October 19, 2011, from [http://msdn.microsoft.com/en-us/library/ff402535\(v=VS.92\).aspx](http://msdn.microsoft.com/en-us/library/ff402535(v=VS.92).aspx)

IST 2473

McClain, G., & Sachs, T. (2004). *Back to the user: Creating user-focused Web sites*. Upper Saddle River, NJ: Prentice Hall.

Miletsky, J. (2003). *Planning, developing, and marketing successful Web sites*. Boston, MA: Thomson Course Technology.

Schneider, G. P. (2011). *Electronic commerce*. Boston, MA: Course Technology Cengage Learning.

Woodbury, C. (2005, June). How safe is your private data? *iSeries News*, 33–41.

Zhao, J. (2003). *Web design and development for e-business*. Upper Saddle River, NJ: Prentice Hall.

IST 2483

Elboth, D. (2004). *The Linux book*. Upper Saddle River, NJ: Prentice Hall.

Hawkins, S. (2003). *Essential Apache*. Upper Saddle River, NJ: Prentice Hall.

Silva, S. (2007). *Web server administration*. Australia: Thomson/Course Technology

Database Administration Technology References

IST 1513

Casteel, J. (2010). *Oracle 11g: SQL*. Boston, MA: Course Technology/Cengage Learning.

Couchman, J. (2001). *OCP introduction to Oracle9i: SQL exam guide*. New York, NY: Osborne/McGraw-Hill.

Dawes, C., & Thomas, B. (2002). *OCA/OCP introduction to Oracle 9i SQL study guide*. San Francisco, CA: Sybex.

Greenberg, N., & Nanthan, P. (2001). *Introduction to Oracle 9i: SQL*. Redwood Shores, CA: Oracle.

Morris-Murphy, L. L. (2003). *Oracle 9i: SQL with an introduction to PL/SQL*. Boston, MA: Thomson Course Technology.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Oracle. (n.d.). Retrieved April 5, 2012, from <http://www.oracle.com>

Oracle 9i Enterprise Edition [Computer software]. (2002). Redwood Shores, CA: Oracle.

Oracle Academy: Software, Training, Resources, and More. (n.d.). In *Oracle Academy*. Retrieved April 5, 2012, from <https://academy.oracle.com/index.html>

Oracle database and applications. (n.d.). Retrieved April 5, 2012, from <http://searchoracle.techtarget.com/resources>

ProSoft Learning Corporation. (n.d.). *Master CIW enterprise developer certification*. Retrieved April 5, 2012, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>

IST 1523

Casteel, J. (2010). *Oracle 11g: SQL*. Boston, MA: Course Technology/Cengage Learning.

Couchman, J. (2001). *OCP introduction to Oracle9i: SQL exam guide*. New York, NY: Osborne/McGraw-Hill.

Dawes, C., & Thomas, B. (2002). *OCA/OCP introduction to Oracle 9i SQL study guide*. San Francisco, CA: Sybex.

Greenberg, N., & Nanthan, P. (2001). *Introduction to Oracle 9i: SQL*. Redwood Shores, CA: Oracle.

Morris-Murphy, L. L. (2003). *Oracle 9i: SQL with an introduction to PL/SQL*. Boston, MA: Thomson Course Technology.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Oracle. (n.d.). Retrieved April 5, 2012, from <http://www.oracle.com>

Oracle 9i Enterprise Edition [Computer software]. (2002). Redwood Shores, CA: Oracle.

Oracle Academy: Software, Training, Resources, and More. (n.d.). In *Oracle Academy*. Retrieved April 5, 2012, from <https://academy.oracle.com/index.html>

Oracle database and applications. (n.d.). Retrieved April 5, 2012, from <http://searchoracle.techtarget.com/resources>

ProSoft Learning Corporation. (n.d.). *Master CIW enterprise developer certification*. Retrieved April 5, 2012, from <http://www.ciwcertified.com/certifications/mced.asp?comm=CND&llm=3>

IST 1534

Abbey, M. S., Abramson, I., & Corey, M. (2004). *Oracle database 10g: A beginner's guide*. New York, NY: McGraw-Hill/Osborne.

Alapati, S. R. (2004). *OCP Oracle database 10g: New features for administrators exam guide*. New York, NY: McGraw-Hill/Osborne.

Bryla, B., & Thomas, B. (2002). *OCA/OCP Oracle9i DBA fundamentals I study guide*. San Francisco, CA: Sybex.

Casteel, J. (2010). *Oracle 11g: SQL*. Boston, MA: Course Technology/Cengage Learning.

Couchman, J., & Marisetti, S. (2002). *OCP Oracle 9i database: Fundamentals I exam guide*. New York, NY: McGraw-Hill/Osborne.

McCullough-Dieter, C. (2003). *Oracle 9i database administrator: Implementation and administration*. Boston, MA: Thomson Course Technology.

National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.

Oracle. (n.d.). Retrieved April 11, 2012, from <http://www.oracle.com>

Oracle 11g [Computer software]. (2010). Redwood Shores, CA: Oracle.
Oracle Academy: Software, Training, Resources, and More. (n.d.). In *Oracle Academy*. Retrieved April 11, 2012, from <https://academy.oracle.com/index.html>

Oracle database and applications. (n.d.). Retrieved April 11, 2012, from <http://searchoracle.techtarget.com/resources>

ProSoft Learning Corporation. (n.d.). *Master CIW enterprise developer certification*. Retrieved April 11, 2012, from http://www.ciwcertified.com/certifications/master_enterprise_developer.php?comm=CND&llm=3

Powell, G. (2007). *Oracle 10g database administrator: Implementation & administration*. Boston, MA: Thomson Course Technology.

IST 2514

- Abbey, M. S., Abramson, I., & Corey, M. (2004). *Oracle database 10g: A beginner's guide*. New York, NY: McGraw-Hill/Osborne.
- Alapati, S. R. (2004). *OCP Oracle database 10g: New features for administrators exam guide*. New York, NY: McGraw-Hill/Osborne.
- Bryla, B., & Thomas, B. (2002). *OCA/OCP Oracle9i DBA fundamentals I study guide*. San Francisco, CA: Sybex.
- Casteel, J. (2010). *Oracle 11g: SQL*. Boston, MA: Course Technology/Cengage Learning.
- Couchman, J., & Marisetti, S. (2002). *OCP Oracle 9i database: Fundamentals I exam guide*. New York, NY: McGraw-Hill/Osborne.
- McCullough-Dieter, C. (2003). *Oracle 9i database administrator: Implementation and administration*. Boston, MA: Thomson Course Technology.
- National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, WA: Bellevue Community College.
- Oracle. (n.d.). Retrieved April 11, 2012, from <http://www.oracle.com>
- Oracle 11g [Computer software]. (2010). Redwood Shores, CA: Oracle.
- Oracle Academy: Software, Training, Resources, and More. (n.d.). In *Oracle Academy*. Retrieved April 11, 2012, from <https://academy.oracle.com/index.html>
- Oracle database and applications. (n.d.). Retrieved April 11, 2012, from <http://searchoracle.techtarget.com/resources>
- ProSoft Learning Corporation. (n.d.). *Master CIW enterprise developer certification*. Retrieved April 11, 2012, from http://www.ciwcertified.com/certifications/master_enterprise_developer.php?comm=CN&llm=3
- Powell, G. (2007). *Oracle 10g database administrator: Implementation & administration*. Boston, MA: Thomson Course Technology.

IST 2524

- Boom, C. (2003). *Hello Linux! A comprehensive hands-on course: Includes Red Hat Linux 8.0*. Lewiston, NY: Lancom Technologies.
- Diaz, C. (2007). *Introduction to UNIX/Linux*. Boston, MA: Charles River Media.

Hahn, H. (2009). *Harley Hahn's guide to Unix and Linux*. Boston, MA: McGraw-Hill Higher Education.

Jang, M. (2004). *RHCE Red Hat Certified Engineer Linux study guide* (4th ed.). New York, NY: McGraw-Hill/Osborne.

Oracle Linux. (2005). Retrieved April 11, 2012, from <http://www.oracle.com/us/technologies/linux/index.html?sckw=srch:linux&SC=srch:linux>

Palmer, M. (2005). *Guide to UNIX using Linux*. Cambridge, MA: Thomson Course Technology.

Red Hat. (2012). Retrieved April 11, 2012, from <http://www.redhat.com>

Wells, N. (2005). *The complete guide to Linux system administration*. Boston, MA: Thomson Course Technology.

IST 2534

Bunin, R. B. (2012). *New perspectives on Microsoft Project 2010: Introductory*. Boston, MA: Course Technology.

Kloppenborg, T. J. (2009). *Contemporary project management: Organize, plan, perform*. Mason, OH: South-Western Cengage Learning.

Project Management Institute. (2012). *Free simulated practice test*. Retrieved April 11, 2012, from <http://www.pmstudy.com>

Project Management Institute. (2012). Retrieved April 11, 2012, from <http://www.pmi.org>

Schwalbe, K. (2011). *Information technology project management*. Boston, MA: Course Technology.

Stover, T. S. (2011). *Microsoft Project 2010 inside out*. Sebastopol, CA: O'Reilly.

IST 1173

Adamski, Joseph J., & Finnegan, Kathleen T. (2011). *Microsoft Access 2010: Comprehensive*. Boston, MA: Course Technology/Cengage Learning.

Rutkosky, Nita, Seguin, Denise, & Roggenkamp, Audrey R. (2011). *Microsoft Access 2010, Levels 1 & 2*. St. Paul, MN: Paradigm Publishing.

Network Security Technology References

IST 1613

- Lewis, J. (2005). *Corporate computer forensic and computer examiner training system: Exercises and laboratory procedures*. Ann Arbor, MI: Huron Valley Publishing.
- Lewis, J. (2005). *Corporate computer forensic and computer examiner training system: Student instruction manual*. Ann Arbor, MI: Huron Valley Publishing.
- U.S. Department of Justice. (2002, July). *Searching and seizing computers and obtaining electronic evidence in criminal investigations*. Retrieved May 31, 2012, from <http://www.justice.gov/criminal/cybercrime/docs/ssmanual2009.pdf>
- Volonino, L., Anzaldua, R., & Godwin, J. (2007). *Computer forensics: Principles and practices*. Upper Saddle River, NJ: Pearson Education.

IST 1624

- Ciampa, M. (2008). *Security+ guide to networking security fundamentals* (3rd ed.). Boston, MA: Course Technology.
- Conklin, W. A., et al. (2004). *Principles of computer security: Security+ and beyond*. Burr Ridge, IL: McGraw-Hill Technology Education.
- Fadia, A. (2005). *The unofficial guide to ethical hacking*. Boston, MA: Course Technology.
- Hackers and cyberterrorists* [Videotape]. (2000). (Available from Films for the Humanities and Sciences, P.O. Box 2053, Princeton, NJ 08543-2053). Retrieved May 31, 2012, from http://ffh.films.com/id/4485/Hackers_and_Cyberterrorists.htm
- Lockhart, A. (2006). *Network security hacks*. Sebastopol, CA: O'Reilly Media.
- Palmer, M. (2003). *Guide to operating systems security*. Boston, MA: Course Technology.
- Regan, P. (2004). *Acing the Security+ certification exam*. Upper Saddle River, NY: Pearson Prentice Hall.
- SecurityFocus. (n.d.). Retrieved May 31, 2012, from <http://www.securityfocus.com/>
- Tanase, M. (2002). *Sniffers: What they are and how to protect yourself*. Retrieved May 31, 2012, from <http://www.securityfocus.com/infocus/1549>

IST 1633

Ciampa, M. (2005). *CWNA guide to wireless LANs* (2nd ed.). Boston, MA: Thomson Course Technology.

Ciampa, M. (2006). *CWSP guide to wireless security*. Boston, MA: Thomson Course Technology.

Regan, P. (2004). *Acing the Security+ certification exam*. Upper Saddle River, NY: Pearson Prentice Hall.

SecurityFocus. (n.d.). Retrieved May 31, 2012, from <http://www.securityfocus.com/>

Tanase, M. (2002). *Sniffers: What they are and how to protect yourself*. Retrieved May 31, 2012, from <http://www.securityfocus.com/infocus/1549>

IST 1643

SecurityFocus. (n.d.). Retrieved May 31, 2012, from <http://www.securityfocus.com/>

Tanase, M. (2002). *Sniffers: What they are and how to protect yourself*. Retrieved May 31, 2012, from <http://www.securityfocus.com/infocus/1549>

Weaver, R. (2007). *Guide to network defense and countermeasures* (2nd ed.). Boston, MA: Thompson Course Technology.

IST 2613

Ciampa, M. (2008). *Security+ guide to networking security fundamentals* (3rd ed.). Boston, MA: Course Technology.

Lockhart, A. (2006). *Network security hacks*. Sebastopol, CA: O'Reilly Media.

Northrup, T., and Thomas, O. (2004). *MCSA/MCSE self-paced training kit (Exam 70-299): Implementing and administering security in a Microsoft Windows Server 2003 network*. Redmond, WA: Microsoft Press.

Stanek, W. R. (2008). *Microsoft Windows command-line administrator's pocket consultant*. Redmond, WA: Microsoft Press.

IST 2623

Bauer, M. D. (2005). *Linux server security* (2nd ed.). Sebastopol, CA: O'Reilly Media.

Hackers and cyberterrorists [Videotape]. (2000). (Available from Films for the Humanities and Sciences, P.O. Box 2053, Princeton, NJ 08543-2053). Retrieved May 31, 2012, from http://ffh.films.com/id/4485/Hackers_and_Cyberterrorists.htm

Palmer, M. (2003). *Guide to operating systems security*. Boston, MA: Course Technology.

Sawicki, E. (2005). *Advanced guide to Linux networking and security*. Boston, MA: Thomson Course Technology.

IST 2634

Fadia, A. (2005). *The unofficial guide to ethical hacking*. Boston, MA: Course Technology.

Hackers and cyberterrorists [Videotape]. (2000). (Available from Films for the Humanities and Sciences, P.O. Box 2053, Princeton, NJ 08543-2053). Retrieved May 31, 2012, from http://ffh.films.com/id/4485/Hackers_and_Cyberterrorists.htm

Lockhart, A. (2006). *Network security hacks*. Sebastopol, CA: O'Reilly Media.

Simpson, M. T. (2010). *Hands-on ethical hacking and network defense*. Boston, MA: Thomson Course Technology.

Baseline, Service, and Related Courses References

IST 1113

Ambrose, A., Bergerud, M., Busche, D., & Morrison, C. (2005). *Computer literacy basics: A comprehensive guide to IC³*. Boston, MA: Course Technology.

Certiport. (n.d.). Retrieved May 31, 2012, from <http://www.certiport.com/Portal/desktopdefault.aspx?tabid=669&roleid=101>

Jernigan, S. *Computer literacy—your ticket to IC³ certification* (1st ed.). (2006). Houston, TX: ELKS Learning.

On the Internet: International Electronic Publication of the Internet Society. (n.d.). Retrieved May 31, 2012, from <http://www.isoc.org/oti/>

Schneider, G., & Evans, J. (2006). *The Internet: 2005 update* (5th ed.). Boston, MA: Thomson Course Technology.

Shelly, G., & Vermaat, M. (2010). *Microsoft Office 2010: Introductory*. Boston, MA: Course Technology.

World Wide Web Consortium (W3C). (2000). *A little history of the World Wide Web*. Retrieved May 31, 2012, from <http://www.w3.org/History.html>

Appendix B: National Workforce Center for Emerging Technologies Skill Standards for Information Technology¹

National Workforce Center for Emerging Technologies Skill Standards for Information Technology for IST Core Courses.										
	Course	IST 1124	CPT 1333	CNT 2423/ CPT 2383	IST 1134	IST 1143	IST 1154	WDT 1123	CPT 1143	IST 1163
National Workforce Center for Emerging Technologies Skill Standards for Information Technology										
ND1		X	X	X	X	X				
ND2		X	X	X	X					
ND3		X	X	X	X					
ND4		X	X	X	X	X				
ND5										
ND6										
ND7						X				
P1							X	X	X	X
P2										
P3							X	X	X	X
P4							X	X	X	X
P5										X
P6										
WD1										
WD2										
WD3							X	X	X	

¹ National Workforce Center for Emerging Technologies. (2003). *Skill standards for information technology*. Bellevue, W PM7A: Bellevue Community College. Copyright 2003 by the National Workforce Center for Emerging Tec PM8hnologies. All rights reserved.

National Workforce Center for Emerging Technologies Skill Standards for Information Technology for Computer Networking Courses.

	Course	IST 1213	IST 1223	IST 1234	IST 1244	IST 1254	IST 2213	IST 2224	IST 2234	IST 2244	IST 2254	IST 2264
National Workforce Center for Emerging Technologies Skill Standards for Information Technology												
ND1		x	x	x	x	x	x	x	x	x	x	x
ND2		x	x		x		x	x	x		x	
ND3		x			x	x	x	x	x	x	x	x
ND4		x	x		x		x	x	x	x	x	
ND5		x		x	x	x	x	x	x	x	x	x
ND6		x		x	x	x	x	x	x	x	x	x
ND7		x	x	x	x		x	x	x		x	x

National Workforce Center for Emerging Technologies Skill Standards for Information Technology for Computer Programming Courses.

	Course	IST 1314	CPT 1323	IST 1324	IST 1334	IST 1483	IST 1714	IST 2314	IST 2324	IST 2334	IST 2344	IST 2354	IST 2364	IST 2374	IST 2384	CPT 2133	IST 1414	IST 1424	CPT 2354	IST 2424	IST 2434	IST 2444	IST 2454	IST 2473	IST 2483
National Workforce Center for Emerging Technologies Skill Standards for Information Technology																									
ND1						X																			
ND2						X																			
ND3						X																			
ND4						X																			
ND5						X																			
ND6						X																			
ND7						X																			
P1			X	X	X		X	X		X	X	X	X	X	X								X		
P2		X	X					X		X	X	X	X	X	X								X		
P3		X	X	X	X		X	X	X	X	X	X	X	X	X								X		
P4		X		X	X		X	X	X	X	X	X	X	X	X								X		
P5				X	X		X	X		X		X	X	X	X								X		
P6								X		X				X	X										
WD1																			X					X	X
WD2																	X		X		X	X		X	
WD3																	X	X	X	X	X	X		X	
WD4																			X						X
WD5																			X		X	X			X
WD6																			X						X
WD7																			X	X					X
WD8																			X			X		X	

National Workforce Center for Emerging Technologies Skill Standards for Information Technology for Database Administration Courses.

	Course	IST 1513	IST 1523	IST 1534	IST 2514	IST 2524	IST 2534	IST 1173
National Workforce Center for Emerging Technologies Skill Standards for Information Technology								
ND1						X		
ND2								
ND3						X		
ND4								
ND5						X		
ND6						X		
ND7								
DA1			X	X	X			
DA2		X	X	X	X			X
DA3		X		X	X			X
DA4			X		X			
DA5								
DA6								
PM1							X	
PM2							X	
PM3							X	
PM4							X	
PM5							X	
PM6							X	
PM7							X	
PM8							X	
PM9							X	
PM10							X	
PM11							X	
PM12							X	
PM13							X	
PM14							X	
PM15							X	

National Workforce Center for Emerging Technologies Skill Standards for Information Technology for Network Security Courses.

	Course	IST 1613	IST 1624	IST 1633	IST 1643	IST 2613	IST 2623	IST 2634
National Workforce Center for Emerging Technologies Skill Standards for Information Technology								
ND1		x	x	x	x	x	x	x
ND2			x	x	x	x	x	
ND3			x	x	x	x	x	
ND4		x	x	x	x	x	x	x
ND5			x	x		x	x	x
ND6			x	x		x	x	x
ND7		x		x	x	x	x	x

Network Design and Administration

ND1 Perform Analysis

- Gather data to identify customer requirements.
- Identify, interpret, and evaluate system network and security requirements.
- Define scope of work.
- Review network architecture, topology, interdependencies, and constraints.
- Research technical alternatives, and analyze technical options.
- Develop project plan.

ND2 Design Network

- Participate in design reviews.
- Prepare integration plan for new processes, protocols, and equipment.
- Recommend selection of architecture, topology, hardware, and software.
- Prepare capacity and throughput plan.
- Specify servers and supporting hardware.
- Specify wired and wireless facilities.
- Integrate network components.

ND3 Configure and Deploy Network

- Plan and document system configuration.
- Implement new system configuration.
- Perform workstation configuration and software loading.
- Support, track, and document change implementation.
- Implement deployment.
- Manage contract personnel.
- Install hardware.
- Perform network fault management.

ND4 Perform Testing

- Define and document test specifications.
- Develop test plan and procedures.
- Schedule and perform testing.
- Document, interpret, and report test results.
- Perform final tests and gain customer acceptance.
- Perform functional verifications and system audits.

ND5 Manage Network

- Set up and maintain user accounts.
- Coordinate, communicate, and document changes.
- Manage inventory.
- Analyze system performance to baseline.
- Monitor and report component and connectivity problems.
- Make recommendations for system optimization, improvement, and security.
- Generate and present reports.
- Monitor capacity to ensure required service levels.
- Manage and implement contingency and emergency recovery plans.

ND6 Maintain Network and Manage Growth

- Develop maintenance and upgrade plans.
- Coordinate maintenance for computer, Web server, and telecommunications networks.
- Apply maintenance upgrades, security enhancements, and process changes.
- Perform system backups, and restore data.
- Troubleshoot and maintain client, server, and network systems.
- Develop growth and capacity plans, and make recommendations.
- Implement growth plans and long-range solutions.

ND7 Perform Security Administration

- Gather and document security requirements.
- Design and document security plan.
- Implement and enforce system and user security requirements.
- Maintain, improve, and enhance security in response to industry developments and user experience.
- Detect, monitor, and report security problems.
- Contribute to and develop recommendations for long-range security plans.

National Workforce Center for Emerging Technologies Skill Standards for Information Technology

Programming/Software Engineering

- P1 Perform Analysis
- Gather data to identify customer requirements.
 - Define scope of work.
 - Define system and software requirements.
 - Identify measurable performance and reliability requirements.
 - Develop test requirements.
 - Develop high-level systems and functional specifications.
 - Identify risks, and determine security requirements and risk reduction strategies.
- P2 Develop Structure
- Choose an architecture.
 - Identify major subsystems and interfaces.
 - Assist with selecting design tools.
 - Develop models.
 - Validate design scheme and models.
- P3 Design/Develop Program
- Develop design and interface specifications.
 - Identify system platform, components, and dependencies.
 - Develop appropriate data model and database scheme.
 - Prepare and conduct design review.
 - Identify maintenance requirements.
 - Create and test prototypes.
 - Review and provide input to user documentation.
 - Incorporate security requirements into design.
- P4 Implement Program
- Write code.
 - Perform unit testing.
 - Integrate subsystems.
 - Lead and/or participate in peer code review.
 - Resolve defects, and revise and adapt existing code.
- P5 Test and Validate Program
- Develop test plan and system.
 - Develop test procedures.
 - Perform test.
 - Document test results, and make recommendations.
 - Modify code based on approval of recommendations.
 - Perform acceptance testing.
 - Perform post-project analysis and validation.

P6 Release Product

- Participate in development of release plan.
- Train technical support staff.
- Participate in development of user training plan.
- Transition to new system.
- Evaluate, correct, and document defects.
- Evaluate, implement, and document enhancements.

National Workforce Center for Emerging Technologies Skill Standards for Information Technology

Web Development and Administration

- WD1 Perform Technical Analysis**
- Gather data to identify customer requirements and capacity.
 - Define scope of work.
 - Prepare and present functional and technical specifications.
 - Prepare preliminary application.
 - Create and define preliminary design or mock-up.
 - Review technical considerations and constraints.
 - Develop project plan.
- WD2 Perform Web Programming**
- Develop site map application models and user interface specifications.
 - Choose a site plan.
 - Select programming languages, design tools, and applications.
 - Write supporting code.
 - Identify major subsystems and interfaces.
 - Develop models.
 - Develop design and interface specifications.
 - Identify system platform, components, and dependencies.
 - Develop appropriate data model.
- WD3 Develop, Deliver, and Manage Content**
- Research content and information architecture.
 - Coordinate content development from multiple contributors.
 - Develop and present concept alternatives.
 - Create or adapt content.
 - Produce graphics, layout elements, and applicable code.
 - Update content.
- WD4 Implement and Maintain Site and Applications**
- Plan rollout.
 - Facilitate move to production system.
 - Hand off to customer or user.
 - Integrate customer feedback.
 - Perform application maintenance.
 - Recommend optimization, and facilitate upgrades and improvements.
 - Document application and site changes.
 - Develop and implement contingency plans.
- WD5 Manage Web Environment**
- Evaluate and recommend Web hardware, software, and third party solutions.
 - Set up server software and hardware.

- Manage server.
- Support systems recovery.

WD6 Manage Enterprise-wide Web Activities

- Define and manage development standards.
- Train designers and developers.
- Evaluate Web technologies and standards.
- Provide quality customer service.
- Perform ROI (return on investment) analysis to ensure business goals are met.
- Design and document security plan.
- Implement and enforce security requirements.
- Maintain and improve security in response to industry developments and user experience.
- Develop enterprise-wide legal and international privacy guidelines.

WD7 Perform Testing and Quality Assurance

- Develop test and acceptance plan.
- Develop test procedures.
- Develop and perform usability and integration testing.
- Perform tests.
- Document test results, and take corrective actions.
- Recommend and implement performance improvements.

WD8 Develop and Implement Web Database

- Develop physical database characteristics, and create database objects.
- Select unique identifiers, and normalize the data model.
- Support population of database.
- Integrate high-level business rules.
- Plan implementation, and deploy database.
- Define and implement user interface.

National Workforce Center for Emerging Technologies Skill Standards for Information Technology

Database Development and Administration

DA1 Analyze and Design Database

- Perform research, and analyze requirements.
- Determine target environment/platform.
- Create and refine conceptual and logical data models.
- Identify high-level business rules for data model.
- Adapt conceptual and logical data models to enterprise model.
- Validate conceptual and logical data models with clients.
- Identify backup and recovery requirements, and create recovery plan.
- Identify access and concurrency requirements.
- Design distributed model.
- Analyze database relative to other databases.

DA2 Develop and Implement Database

- Develop physical database characteristics, and define user interface.
- Create database objects.
- Select unique identifiers, and normalize the data model.
- Support population of database.
- Integrate high-level business rules with code.
- Develop back-end and front-end connectivity.
- Develop and validate database implementation plan.
- Install and deploy database.
- Produce business and technical documents.
- Tune database, and optimize performance.

DA3 Perform Administration and Maintenance

- Develop and implement monitoring plan.
- Analyze monitoring data.
- Manage on-site and off-site backup and recovery.
- Create and implement maintenance plan for regular integrity checks.
- Maintain physical organization of database objects.
- Upgrade databases, and migrate to new versions.
- Plan and manage current and future physical resource requirements and enhancements.
- Administer and enforce standards.
- Audit database systems.

DA4 Provide Data Assurance

- Gather and document security requirements and specifications.
- Design and document security plan.
- Implement and enforce security requirements.

- Maintain and improve security in response to industry developments and user experience.
- Protect enterprise/client data.

DA5 Provide Client and User Services

- Provide and support development and production environments.
- Plan and deliver user training.
- Identify additional requirements.
- Adapt existing structure to new business environments.

DA6 Perform Database Test

- Develop test plans.
- Develop test procedures.
- Perform tests.
- Document test results, and make recommendations.
- Test database components.
- Implement performance testing.

National Workforce Center for Emerging Technologies Skill Standards for Information Technology

Project Management

- PM1 Define scope of project.
- PM2 Identify stakeholders, decision makers, and escalation procedures.
- PM3 Develop detailed task list (work breakdown structures)
- PM4 Estimate time requirements
- PM5 Develop initial project management flowchart.
- PM6 Identify required resources and budget.
- PM7 Evaluate project requirements.
- PM8 Identify and evaluate risks.
- PM9 Prepare contingency plan.
- PM10 Identify interdependencies.
- PM11 Identify and track critical milestones.
- PM12 Participate in project phase review.
- PM13 Secure needed resources.
- PM14 Manage the change control process.
- PM15 Report project status.

Appendix B: Related Academic Standards²

Related Academic Standards for IST Core Courses										
	Course	IST 1124	CPT 1333	CNT 2423/ CPT 2383	IST 1134	IST 1143	IST 1154	WDT 1123	CPT 1143	IST 1163
Related Academic Standards										
R1		x	x	x	x	x	x	x	x	x
R2						x				
R3		x	x	x	x	x	x	x	x	x
R4		x	x	x	x	x	x	x	x	
R5		x	x	x	x	x	x	x	x	x
M1		x	x	x	x					
M2		x	x	x	x					
M3		x	x	x	x					
M4		x	x	x	x					
M5		x	x	x	x	x				
M6						x				
M7		x	x	x	x	x				x
M8										
M9		x	x	x	x					
A1		x	x	x	x	x				
A2										
A3		x	x	x	x	x				
A4		x	x	x	x					
A5		x	x	x	x	x				
A6										
A7		x	x	x	x	x				
A8		x		x	x	x				
L1		x	x	x	x	x				
L2		x	x	x	x	x				
L3						x				
L4		x	x	x	x	x				
L5						x				
L6		x	x	x	x	x				

² CTB/McGraw-Hill LLC. (1994). *Tests of adult basic education, forms 7 and 8*. Monterey, CA: Author. Reproduced with permission of CTB/McGraw-Hill LLC. TABE is a registered trademark of The McGraw-Hill Companies, Inc. Copyright 1994 by CTB/McGraw-Hill LLC. Reproduction of this material is permitted for educational purposes only.

Related Academic Standards for Computer Networking Courses

	Course	IST 1213	IST 1223	IST 1234	IST 1244	IST 1254	IST 2213	IST 2224	IST 2234	IST 2244	IST 2254	IST 2264
Related Academic Standards												
R1		X	X	X	X	X	X	X	X	X	X	X
R2		X	X	X	X	X	X	X	X	X	X	X
R3		X	X	X	X	X	X	X	X	X	X	X
R4		X		X	X	X	X	X	X	X	X	X
R5		X	X	X	X	X	X	X	X	X	X	X
M1		X	X				X	X	X	X	X	X
M2		X	X				X	X	X	X	X	X
M3		X	X				X	X	X	X	X	X
M4		X	X				X	X	X	X	X	X
M5		X	X	X	X	X	X	X	X	X	X	X
M6		X	X	X	X	X	X	X	X	X	X	X
M7		X	X	X	X	X	X	X	X	X	X	X
M8		X		X	X	X	X	X	X	X	X	X
M9		X	X	X	X	X	X	X	X	X	X	X
A1		X	X	X	X	X	X	X	X	X	X	X
A2		X	X	X	X	X	X	X	X	X	X	X
A3		X	X	X	X	X	X	X	X	X	X	X
A4		X	X	X	X	X	X	X	X	X	X	X
A5		X	X	X	X	X	X	X	X	X	X	X
A6		X	X	X	X	X	X	X	X	X	X	X
A7		X	X	X	X	X	X	X	X	X	X	X
A8		X	X	X	X	X	X	X	X	X	X	X
L1		X	X	X	X	X	X	X	X	X	X	X
L2		X	X	X	X	X	X	X	X	X	X	X
L3		X	X	X	X	X	X	X	X	X	X	X
L4		X	X				X	X	X	X	X	X
L5		X	X				X	X	X	X	X	X
L6		X	X				X	X	X	X	X	X

Related Academic Standards for Computer Programming Courses

[illegible]

Related Academic Standards for Database Administration Courses

	Course	IST 1513	IST 1523	IST 1534	IST 2514	IST 2524	IST 2534	IST 1173
Related Academic Standards								
R1		X	X	X	X	X	X	X
R2		X	X	X	X	X	X	X
R3		X	X	X	X	X	X	X
R4		X	X	X	X	X	X	X
R5		X	X	X	X	X	X	X
M1		X	X	X	X	X	X	X
M2		X	X	X	X	X	X	X
M3		X	X	X	X	X	X	X
M4		X	X	X	X	X	X	X
M5		X	X	X	X	X	X	X
M6		X	X	X	X	X	X	X
M7		X	X	X	X	X	X	X
M8		X	X	X	X	X	X	X
M9		X	X	X	X	X	X	X
A1		X	X	X	X	X	X	X
A2							X	X
A3		X	X	X	X	X	X	X
A4							X	X
A5		X	X	X	X	X	X	X
A6								
A7		X	X	X	X	X	X	X
A8		X	X	X	X	X	X	X
L1							X	
L2							X	
L3							X	
L4		X	X	X	X	X	X	X
L5		X	X	X	X	X	X	X
L6		X	X	X	X	X	X	X

Related Academic Standards for Network Security Courses

	Course	IST 1613	IST 1624	IST 1633	IST 1643	IST 2613	IST 2623	IST 2634
Related Academic Standards								
R1		X	X	X	X	X	X	X
R2		X	X	X	X	X	X	X
R3		X	X	X	X	X	X	X
R4		X	X	X	X	X	X	X
R5		X	X	X	X	X	X	X
M1								
M2								
M3								
M4								
M5		X	X	X	X	X	X	X
M6		X	X	X	X	X	X	X
M7		X	X	X	X	X	X	X
M8								
M9								
A1		X	X	X	X	X	X	X
A2								
A3		X	X	X	X	X	X	X
A4								
A5		X	X	X	X	X	X	X
A6								
A7		X	X	X	X	X	X	X
A8		X	X	X	X	X	X	X
L1		X	X	X	X	X	X	X
L2		X	X	X	X	X	X	X
L3		X	X	X	X	X	X	X
L4		X	X	X	X	X	X	X
L5		X	X	X	X	X	X	X
L6		X	X	X	X	X	X	X

Reading

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary and paraphrase, compare and contrast, cause and effect)

R5 Evaluate/Extend Meaning (fact and opinion, predict outcomes, point of view)

Mathematics Computation

- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations

Applied Mathematics

- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)

Language

- L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

Spelling

- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

Appendix C: 21st Century Skills³

21st Century Crosswalk for IST Core Courses										
	Courses	IST 1124	CPT 1333	CNT 2423/ CPT 2383	IST 1134	IST 1143	IST 1154	WDT 1123	CPT 1143	IST 1163
21st Century Standards										
CS1		X	X	X		X	X	X	X	
CS2						X				
CS3										
CS4										
CS5										
CS6										
CS7		X	X	X	X	X	X	X	X	X
CS8		X	X	X	X	X	X	X	X	X
CS9										
CS10										
CS11										
CS12										
CS13		X	X	X	X	X	X	X	X	
CS14										
CS15										
CS16										

³ 21st century skills. (n.d.). Washington, DC: Partnership for 21st Century Skills.

21st Century Crosswalk for Computer Networking Courses

[illegible]

21st Century Crosswalk for Computer Programming Courses

	Courses	IST 1314	CPT 1323	IST 1324	IST 1334	IST 1483	IST 1714	IST 2314	IST 2324	IST 2334	IST 2344	IST 2354	IST 2364	IST 2374	IST 2384	CPT 2133	IST 1414	IST 1424	CPT 2354	IST 2424	IST 2434	IST 2444	IST 2454	IST 2473	IST 2483
21 st Century Standards																									
CS1						X										X			X				X		
CS2																X			X				X		
CS3																			X				X		
CS4																									
CS5						X																	X		
CS6		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
CS7		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CS8		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CS9		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CS10		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CS11		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CS12																X			X				X		
CS13																X			X				X		
CS14																X			X						
CS15																X			X				X		
CS16																X			X				X		

21st Century Crosswalk for Database Administration Courses

	Courses	IST 1513	IST 1523	IST 1534	IST 2514	IST 2524	IST 2534	IST 1173
21 st Century Standards								
CS1								
CS2		X	X	X	X	X	X	X
CS3		X	X	X	X	X	X	X
CS4								
CS5		X	X	X	X	X	X	X
CS6		X	X	X	X	X	X	X
CS7		X	X	X	X	X	X	X
CS8		X	X	X	X	X	X	X
CS9		X	X	X	X	X	X	X
CS10		X	X	X	X	X	X	X
CS11		X	X	X	X	X	X	X
CS12		X	X	X	X	X	X	X
CS13		X	X	X	X	X	X	X
CS14		X	X	X	X	X	X	X
CS15		X	X	X	X	X	X	X
CS16		X	X	X	X	X	X	X

21st Century Crosswalk for Network Security Courses

	Courses	IST 1613	IST 1624	IST 1633	IST 1643	IST 2613	IST 2623	IST 2634
21st Century Standards								
CS1				X	X	X	X	X
CS2		X	X	X	X	X	X	X
CS3		X	X	X	X	X	X	X
CS4								
CS5		X	X	X	X	X	X	X
CS6		X	X	X	X	X	X	X
CS7		X	X	X	X	X	X	X
CS8		X	X	X	X	X	X	X
CS9		X	X	X	X	X	X	X
CS10		X	X	X	X	X	X	X
CS11		X	X	X	X	X	X	X
CS12		X	X	X	X	X	X	X
CS13		X	X	X	X	X	X	X
CS14		X	X	X	X	X	X	X
CS15		X	X	X	X	X	X	X
CS16		X	X	X	X	X	X	X

CS1 Global Awareness

1. Using 21st century skills to understand and address global issues
2. Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
3. Understanding other nations and cultures, including the use of non-English languages

CS2 Financial, Economic, Business and Entrepreneurial Literacy

1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options

CS3 Civic Literacy

1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national and global levels
3. Understanding the local and global implications of civic decisions

CS4 Health Literacy

1. Obtaining, interpreting and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues

CS5 Environmental Literacy

1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems
2. Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)
3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions
4. Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)

CS6 Creativity and Innovation

1. Think Creatively
2. Work Creatively with Others
3. Implement Innovations

CS7 Critical Thinking and Problem Solving

1. Reason Effectively
2. Use Systems Thinking
3. Make Judgments and Decisions
4. Solve Problems

CS8 Communication and Collaboration

1. Communicate Clearly
2. Collaborate with Others

CS9 Information Literacy

1. Access and Evaluate Information
2. Use and Manage Information

CS10 Media Literacy

1. Analyze Media
2. Create Media Products

CS11 ICT Literacy

1. Apply Technology Effectively

CS12 Flexibility and Adaptability

1. Adapt to change
2. Be Flexible

CS13 Initiative and Self-Direction

1. Manage Goals and Time
2. Work Independently
3. Be Self-directed Learners

CS14 Social and Cross-Cultural Skills

1. Interact Effectively with others
2. Work Effectively in Diverse Teams

CS15 Productivity and Accountability

1. Manage Projects
2. Produce Results

CS16 Leadership and Responsibility

1. Guide and Lead Others
2. Be Responsible to Others