



**NCTI**

Powers Frontline Performance

# TRAINING KIT

## CONTACT INFORMATION:

For assistance ordering or accessing courses or more information about NCTI, please contact Customer Care:

Phone: **866.575.7206**

Fax: **303.797.9394**

Email: **customer care@ncti.com**

Office Hours: **7am-5pm (MST) Monday-Friday**



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- » Managing Remote Employees
- » The Effective Manager's Toolbox
- » Effective Supervision
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(Continued)

Visit [www.ncti.com](http://www.ncti.com) and click FAQ for important information on computer hardware/software requirements and NCTI course policies.

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  - Business Communication and Report Writing
  - Project Management in Organizations
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  - Negotiation and Conflict Resolution
  - Principles of Sales



# NCTI's PROFESSIONAL SERVICES

Our team offers specialized knowledge and expertise through Professional Services that will effectively bring best in class solutions to your organization's projects with a proven return on investment. Our approach to relationships and service delivery helps clients across the globe leverage new opportunities, improve performance and enhance value.

The NCTI® Professional Services team has worked with industry leading companies throughout the United States, in various markets, thus bringing a unique talent to your project. Our Education Professionals, Instructional Designers and Technology Specialists are experienced at delivering solution-based products and services to meet your educational, certification and assessment needs.

## OUR PROFESSIONAL SERVICES INCLUDE:

- » Custom Curriculum Development
- » Instructional Design Consulting
- » Instructor-Led Training
- » Product Education and Certification
- » Assessment Programs
- » Paper to e-learning Conversion
- » Testing and Verification Services
- » Career Path Progression
- » Train the Trainer

## THE NCTI PROFESSIONAL SERVICES APPROACH

NCTI applies a “three point” process to our services, creating custom workforce solutions for our clients. This process consists of knowledge management, technology expertise and project management. These components are critical to ensuring the solution we provide surpasses expectations while being delivered on-time and within budget.

We pride ourselves on our bright, motivated and committed team of experienced Instructional Design experts and our hands-on approach to solving complex training and education issues. Through our understanding of our customer's commercial objectives, the technical issues during implementation of a project and our breadth of knowledge, our Professional Services team minimizes the effort required to implement a project and maximizes a customer's return on investment in the product or solution.





# TECHNICAL COURSES



# NCTI'S COLLEGE CERTIFICATE AND DEGREE PROGRAM

Advance Your Career Through Professional Education



Earn college credit while learning job-specific skills through NCTI's College Certificate and Degree Program, the only distance-learning, accredited higher education program designed specifically for the broadband and cable industry. The College Certificate and Degree Program allows individuals to apply virtually all NCTI courses to college-level certificates and two-year degrees.

## BROADBAND TECHNOLOGY CERTIFICATE

Broadband cable industry professionals including line technicians, maintenance technicians, fiber optics technicians, headend technicians, persons in related positions and their managers should earn this certificate. Individuals doing so will be qualified in design, construction, installation, maintenance and service of broadband coaxial and fiber networks.

### Courses

CTC 107	Installer	3 credit hours
CTC 109	Installer Technician	4 credit hours
CTC 111	Service Technician	4 credit hours
CTC 113	System Technician	4 credit hours
CTC 127	Fiber Testing and Maintenance	2 credit hours
CTC 128	Fiber Installation and Activation	2 credit hours
CTC 129	Digital Technician	3 credit hours
CTC 165	Advanced Technician	4 credit hours

### TOTAL:

**26 CREDIT HOURS**

*\* Note: Students who complete this certificate may earn an Associate of Applied Science degree in Broadband Technology and Communication by completing an additional 35 specified credit hours (see next page for more information).*

## GET STARTED TODAY

1. Check with your supervisor on how NCTI works with your company. Many companies cover the expense of your tuition and offer incentives and raises for graduation from a course.
2. Obtain course descriptions and the NCTI enrollment application from your supervisor, your company's NCTI training coordinator, or your human resources department.
3. You can also obtain course descriptions and a course application by clicking on the *Curriculum* tab of our website, [www.ncti.com](http://www.ncti.com), calling **866.575.7206** or emailing [info@ncti.com](mailto:info@ncti.com).
4. Fill out the application completely, include your payment and mail to: **NCTI, 6855 South Havana Street, Suite 300, Centennial, CO 80112**
5. Your course materials will be shipped—if applicable—within 48 hours of receipt of payment.

For more information, call 866.575.7206, email [sales@ncti.com](mailto:sales@ncti.com) or visit [www.ncti.com](http://www.ncti.com)

# ASSOCIATE OF APPLIED SCIENCE IN BROADBAND TECHNOLOGY AND COMMUNICATION DEGREE FROM ACC



Through our partnership with Arapahoe Community College (ACC), regionally accredited by the North Central Association of Colleges and Schools, NCTI is pleased to provide students a straightforward path to advanced skills, opportunities for professional growth and a college degree.

The Associate of Applied Science degree allows students to complete the **NCTI Certificate of Broadband Technology**,

combined with general education courses, major courses and restricted electives. The result is a versatile, professional degree that demonstrates both job-specific expertise and general business knowledge.

Be advised, while most courses are available anytime, others are only offered up to three times per year. Visit [www.ncti.com](http://www.ncti.com) for course availability and schedules.

## GENERAL EDUCATION REQUIREMENTS

ENG 131	Technical Writing	3 credit hours
ENG 121	English Composition I	3 credit hours
MAT 108	Technical Mathematics	4 credit hours
	or Higher level college math course	4 credit hours
COM 125	Interpersonal Communication	3 credit hours
CIS 118	Introduction to PC Applications	3 credit hours
BUS 115	Introduction to Business	3 credit hours
MAN 116	Effective Supervision	3 credit hours

**19 credit hours**

## RESTRICTED ELECTIVES

COM 220	Intercultural Communication	3 credit hours
MAR 111	Principles of Sales	3 credit hours
BUS 217	Business Communication and Report Writing	3 credit hours
MAR 216	Introduction to Marketing	3 credit hours
MAN 226	Principles of Management	3 credit hours
CTC 117	Computers and Broadband Modems	3 credit hours
CTC 118	Broadband Digital Installer	3 credit hours

**6 credit hours**

## CORE REQUIREMENTS

MAR 160	Excellence in Customer Service	3 credit hours
PSY 116	Stress Management	3 credit hours
PSY 101	General Psychology I	3 credit hours
BUS 241	Cultural Diversity in Business	3 credit hours
MAN 117	Time Management	1 credit hour

**10 credit hours**

**Note:** Course titles may vary at ACC.

## PLAN OF STUDY (SPECIALIZATION)

### BROADBAND TECHNOLOGY

CTC 107	Installer	3 credit hours
CTC 109	Installer Technician	4 credit hours
CTC 111	Service Technician	4 credit hours
CTC 113	System Technician	4 credit hours
CTC 127	Fiber Testing and Maintenance	2 credit hours
CTC 128	Fiber Installation and Activation	2 credit hours
CTC 129	Digital Technician	3 credit hours
CTC 165	Advanced Technician	4 credit hours

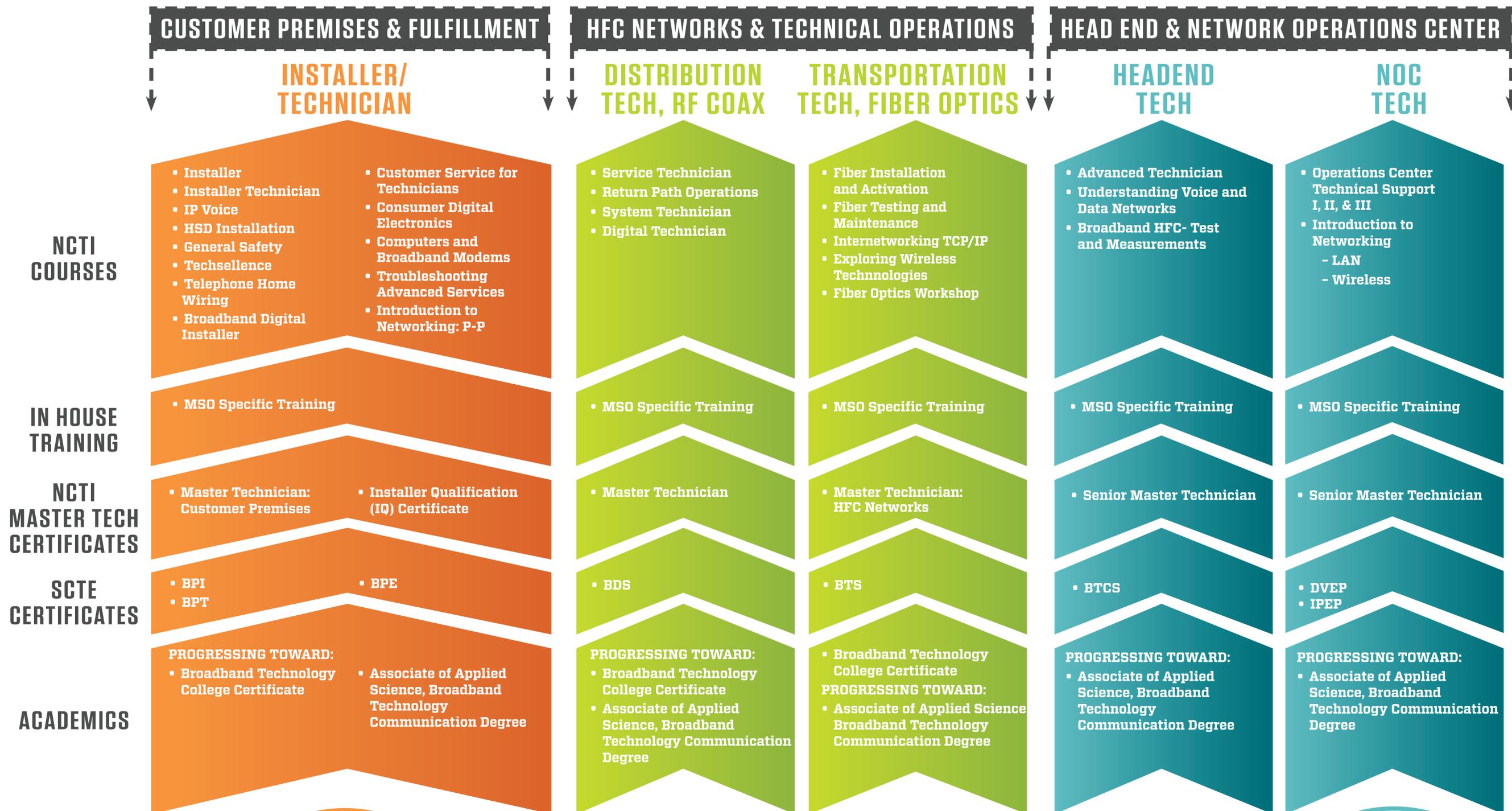
**26 credit hours**

**DEGREE TOTAL: 61 CREDIT HOURS**



For more information, call 866.575.7206, email [sales@ncti.com](mailto:sales@ncti.com) or visit [www.ncti.com](http://www.ncti.com)

# Integrated Career Path for Broadband Field Operations



Contact NCTI Customer Care at 866.575.7206 to map out your individual career path. You may be on your way to earning your Broadband Technology College Certificate or Associate of Applied Science, Broadband Technology Degree.



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Instant Knowledge for Field Teams

Mobile learning puts immediate, relevant and custom content directly into the hands of field teams on the device they carry with them all day.



# NCTI'S MASTER TECHNICIAN CERTIFICATION PROGRAM

The NCTI Master Technician Certification Program identifies technicians and engineers who have mastered skills to be regarded as the Industry's elite. To be eligible, students must successfully complete a defined set of courses related to specific broadband operations.

## MASTER INSTALLER (MI)

This certificate confirms a higher level of service by recognizing new technologies as well as best practices for all facets of a broadband cable installation.

### REQUIRED COURSES:

- » Installer
- » TechSELLence
- » Applying Wi-Fi Technologies
- » Consumer Digital Electronics

## MASTER TECHNICIAN (MT)

This certification confirms knowledge and expertise in broadband network and drop installation practices and procedures.

### REQUIRED COURSES:

- » Installer
- » Installer Technician
- » Service Technician
- » System Technician
- » Fiber Installation & Activation
- » Fiber Testing & Maintenance
- » Advanced Technician

## MASTER TECHNICIAN, CUSTOMER PREMISES (MTC)

This certificate confirms the ability to install, maintain and troubleshoot analog and digital services in the drop network from the distribution tap to the terminating device at the customer's premises.

### REQUIRED COURSES:

- » Installer
- » Broadband Digital Installer
- » Troubleshooting Advanced Services
- » Consumer Digital Electronics
- » Computers and Broadband Modems
- » Installer Technician
- » Return Path Operations

## MASTER TECHNICIAN, HFC NETWORKS (MTH)

This certificate confirms a proficiency in HFC network maintenance practices and procedures and is qualified to service and maintain two-way analog and digital services in the coaxial distribution system, fiber-optic system, and headend.

### REQUIRED COURSES:

- » Service Technician
- » Return Path Operations
- » System Technician
- » Fiber Installation & Activation
- » Fiber Testing & Maintenance
- » Digital Technician
- » Advanced Technician

## SENIOR MASTER TECHNICIAN (SMT)

This certificate confirms expertise on all HFC network and drop installation practices and procedures and can troubleshoot and maintain the entire system from the customer's premises through the headend.

### REQUIRED COURSES:

- » Master Technician, Customer Premises Certification
- » Master Technician, HFC Networks Certification
- » Understanding Voice and Data Networks
- » Business Services for Technicians

Ready to achieve field success?  
Learn with NCTI:  
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# Master Technician Recertification Test

As the premier training and certification body in the cable and broadband industry for over 45 years, NCTI provides recertification for Master Technicians to ensure the continued aptitude of previously recognized technicians.

Our 75-question, 3-hour recertification assessments require a passing grade of 80% in order to earn recertification. Each assessment purchase grants the technician one exam attempt and a 60-day recertification resource-specific subscription to the NCTI Amp Library. This exam is not proctored and is open-book; usage of the Library is encouraged while taking this exam. Technicians who fail may purchase additional opportunities to pass. Questions are pulled from a pool of approximately 3,000 questions and will vary each time the assessment is taken.

NCTI currently offers recertification for the following:

- » Master Technician
- » Master Technician, HFC Networks
- » Master Technician, Customer Premises
- » Senior Master Technician

Recertification guidelines go into effect for each technician when he or she first certifies. Effective January 1, 2014, previously certified technicians have three years (36 months) to meet these new provisions.

## Master Technician Equivalency Exams

The Master Technician collection of test-out assessments is ideal for organizations that have developed comprehensive in-house new hire and early-career training and for those seasoned technicians that have considerable knowledge and experience but have not pursued industry certification or advanced learning. In both instances, many installers and technicians are missing out on the opportunity to become a certified NCTI Master Technician. Master Technician certification offers the employee additional opportunities for growth and development which leads to increased employee retention and customer satisfaction. These assessments offer experienced technicians and installers the opportunity to progress toward becoming a Master Technician by testing out of courses and then pursuing course work that relates closer to their job responsibilities, skill sets and goals. Upon successful completion of these exams, NCTI will consider the student as having passed these required courses for Master Technician certification and the student will earn the applicable college credit. These assessments also offer MSOs an opportunity to integrate the NCTI Master Technician courses into their total training program. Students have 30 days from point of enrollment to complete the exams. Master Technician certification is the starting point for a College Certificate or Associates Degree and may also allow technicians to prepare for other industry certifications. Additionally, an MSO can use the Installer or higher level exam as a new hire placement assessment to evaluate a candidate's level of technical knowledge.



# NCTI Telecom Specialist

Contact NCTI to map out your career path. You may be on your way to earning a College Certificate or Degree.



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access to learning  
content and  
tools

The NCTI Telecom Specialist Certification recognizes the distinct expertise of installation professionals who support legacy subscriber services.

An NCTI-certified Telecom Specialist is skilled in the installation and troubleshooting of modern and legacy subscriber services over a copper pair network and fiber optic networks such as Passive Optical Networks (PON) and Fiber to the Premises (FTTP). The services include Plain Old Telephone Service (POTS), Digital Subscriber Line (DSL), Voice over IP (VoIP).

To be qualified as an NCTI Telecom Specialist, industry professionals must successfully complete a defined set of courses related to this specific set of proficiencies.



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## Integrated Career Path for Telecom Specialist

### NCTI TELECOM SPECIALIST COURSES

- Introduction to Telecom Operations
- Telephone Home Wiring
- Applying Wi-Fi Technologies
- Fiber Installation and Activation
- Fiber Testing and Maintenance
- Introduction to Wide Area Networks
- Understanding Voice and Data Networks

### IN HOUSE TRAINING

- MSO Specific Training

### TECHNICAL CERTIFICATES

- Telecom Specialist

### PROGRESSING TOWARD

- Master Technician
- Master Technician, HFC Networks

### ACADEMICS

- PROGRESSING TOWARD:
- Broadband Technology College Certificate
  - Associate of Applied Science, Broadband Technology Communication Degree



# Installer

Part of the *Master Technician Certification Series*

## OVERVIEW

The Installer course is the foundation for NCTI's Technical Career Path, as well as an essential preparation for the Broadband Digital Installer and Installer Technician courses. Beginning with a comprehensive overview of a broadband cable system, the course provides the student with a working knowledge of the system from the signal sources to the customer premises equipment, while teaching the student proper installation and troubleshooting techniques. This course discusses transmission mediums—Wi-Fi, Multimedia over Coax Alliance (MoCA) and quad play technologies, such as video, voice, data and home security services. The student is also provided with the processes and procedures surrounding digital signal tests and measurements. Specific references to more than 50 basic safety standards (OSHA and ANSI) as well as electrical codes (NEC and NESC) are made throughout the course.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online. Students will be able to print a resource guide.

### **Completion Time:**

The estimated completion time for this course is 30 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry recognized NCTI certificate of graduation
- » earn three hours of college credit
- » can use this course to help prepare for SCTE's Broadband Premises Installer certification
- » receive credit towards NCTI Master Technician certification
- » receive credit toward NCTI Master Installer certification

### **Ideal for:**

- » newly hired installers
- » experienced technicians and installers interested in a refresher on current installation techniques

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe the operation of a broadband cable system
2. explain the safety regulations, customer service requirements, functions of drop components and connection/interface of customer premises equipment in a broadband drop system
3. identify customer concerns and solve customer problems
4. correctly use and maintain all required installation hand and power tools
5. describe required ladder inspections and practice safe ladder handling techniques
6. describe the required pole climbing safety inspections and safe pole climbing procedures
7. identify features and control components, perform measurements and maintain digital multi meters and signal level meters
8. identify F-connectors and explain how to install various indoor and environmentally sealed F-connectors

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Broadband Digital Installer
- » Installer Technician
- » Customer Service for Technicians
- » Consumer Digital Electronics

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials enhanced with online videos
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

9. describe the use of passive optical networks (PON) architecture and equipment
10. explain the Radio frequency over glass (RfOG) standard
11. safely and correctly perform single resident aerial and underground installations from the tap to the customer premises equipment, following all pertinent safety regulations and recommended practices/procedures
12. interpret digital measurements to evaluate digital signal quality
13. examine the fundamentals of coaxial drop cable, fiber-optic drop cable, twisted-pair cable, Wi-Fi and MoCA technologies

## COURSE OUTLINE

### 1. Broadband Technology Overview

Explaining network architecture, analyzing frequency, channels and power, examining analog and digital signals and understanding bandwidth

### 2. Transmission Mediums

Examining the fundamentals of coaxial drop cable, fiber optic drop cable and twisted-pair cable, describing Wi-Fi technology, Multimedia over Coax Alliance (MoCA) and the function of drop passives and actives

### 3. Quad-Play Technologies

Understanding various digital television formats and displays available to customers, describing recording and playing devices, examining high-speed data, data delivery and hardware and discussing IP voice services and home security systems

### 4. Safe Installation Practices

Examining personal protective equipment, ladder safety equipment, pole climbing safety equipment, evaluating the foreign voltage detector, understanding OSHA standards and discussing fiber-optic drop safety

### 5. Accessing Aerial Plant

Understanding the aerial plant and discussing ladder safety, proper climbing techniques and how to use a bucket truck

### 6. Installation Tools

Examining installation tools and test equipment

### 7. Exterior Coaxial Cable Craftsmanship

Examining first steps to quality work, understanding how to install underground cable and aerial cable, identifying drop installation best practices and understanding how to mount splitters, attach the drop to the premises and bond the drop

### 8. Interior Coaxial Cable Craftsmanship

Examining interior cable routing and how to fish walls, examining how to connectorize drop cable and discussing multiple dwelling unit installations

### 9. Troubleshooting the Drop

Analyzing the troubleshooting process and examining ingress, egress and filters

### 10. FTTx Basics

Describing overall fiber-optic network architectures and examining step-by-step how to connect a customer with a fiber-optic drop.

### 11. Customer Service Essentials

Identifying internal vs. external customers, examining communication skills and examining personal standards, customer retention, effective customer interactions and stress management

### 12. Work Order: Video Services Installation

Examining video services equipment and diagnostics, identifying how to connect video services, understanding television services and controls, discussing customer education and troubleshooting video problems

### 13. Work Order: High-Speed Data Services Installation

Discussing site surveys, analyzing Ethernet, examining wiring/design topologies, modems, computer/HSD device setup and wiring errors and troubleshooting HSD

### 14. Work Order: Voice Services Installation

Understanding voice services installation and telephone installation, describing tools, connectors and cordage in telephone wiring, examining alarm systems, identifying and testing common devices used on home telephone networks and troubleshooting IP voice installation

### 15. Work Order: Home Security Installation

Understanding unique customer service situations, identifying how to install home security systems and examining how to finish the installation.



# Techselligence

## OVERVIEW

Techselligence is an online course designed to help you remain competitive by expanding sales opportunities while in the customer's home. This course teaches field personnel to effectively evaluate each customer's unique situation, use that information to introduce customers to enhanced services and products and ensure a positive customer experience. The student will learn to quickly grasp communication and observation strategies by reviewing various customer/field personnel interactions. With effective communication skills on the job, the student will proficiently drive overall customer satisfaction and increase sales.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » increase product knowledge and enhance customer contact skills
- » understand practical applications to test their knowledge and help improve their job performance
- » identify clues within the customers' premises that open new sales and communication opportunities
- » understand the value of caring for customers' needs and increase customer service ratings
- » increase revenue potential for enhanced services
- » receive an industry-recognized NCTI® certificate of graduation
- » receive credit toward NCTI Master Installer certification

### **Ideal for:**

Field personnel, including:

- » technicians
- » installers

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. evaluate each customer's situation and use that information for mutual benefit
2. understand why communication skills are as important as technical skills
3. react appropriately to negative customer contact
4. expand their professionalism in the field and give customers one more reason to remain loyal
5. use teamwork and product knowledge to improve customer satisfaction
6. emphasize the importance of their role and highlight creative ways to increase customer satisfaction in light of increasing competition
7. identify how to make customers more aware of enhanced services

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

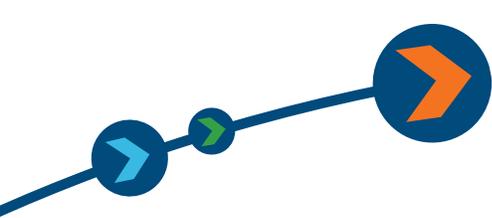
- » Installer
- » Broadband Digital Installer
- » Installer Technician

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Video-rich and interactive course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

### 1. Sales and Service Culture

Discussing fundamentals of customer service and exploring customer situations

### 2. Why is Change Needed?

Identifying purpose of customer service, discussing various communication techniques and exploring customer service benefits

### 3. How do I do it?

Defining teamwork, identifying examples of teamwork, understanding product knowledge, identifying benefits of product knowledge, determining individual level of product knowledge, examining customer scenarios and identifying clues and identifying steps to assist customers

### 4. Working with the Customer

Examining communication techniques regarding negative customer contact, identifying opportunities to upgrade and examining customer scenarios to identify communication techniques

### 5. Wrap-up

Reviewing communication tools, re-examining steps to customer service and reviewing areas of product knowledge tied to sales opportunities



# Field Safety

## OVERVIEW

The Field Safety course is an excellent resource for the technician who values safety and desires to understand the reasoning behind safe work practices. This course was specifically designed to give the technician necessary knowledge tools to perform with greater safety on the job. Personal protective Equipment (PPE), correct pole climbing techniques, proper ladder handling and methods for identifying foreign voltages are just a few topics covered in this course. The latest OSHA requirements are identified and covered in detail. Field Safety is meant to be both a standalone course; and a component of the Installer course series.

### **Delivery Options:**

 This course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

Varies based on the student's self-study pace, however, the maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry recognized NCTI certificate of graduation
- » use what they've learned to help prepare for SCTE's Broadband Premises Installer certification

## COURSE OBJECTIVES

Upon completing this course, the student will be able to:

1. explain proper inspection and use of safety equipment
2. describe best practices for ladder safety
3. describe best practices for pole safety
4. use a foreign voltage detector when checking for stray voltage
5. identify when a hot chassis condition occurs and how to identify the source
6. analyze fiber-optic drop safety best practices
7. identify the equipment necessary to prepare a company vehicle
8. describe how to perform maintenance checks on a company vehicle
9. describe safety rules to be followed when driving a company vehicle
10. describe safe and effective practices prior to using a ladder or starting to climb a pole in order to access the aerial portion of the plant
11. describe safe and effective practices while on a ladder or climbing a pole to access the aerial components of the plant
12. describe safe and effective ladder and pole climbing practices when descending from the aerial portion of the plant
13. identify the proper use of a bucket truck when used to access the aerial elements of the plant

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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(Continued)



## COURSE OUTLINE

### 1. Safe Installation Practices

Examining personal protective equipment; discussing vehicle maintenance and use, ladder safety equipment and pole climbing safety equipment; evaluating the foreign voltage detector; understanding OSHA standards and discussing fiber-optic drop safety

### 2. Accessing Aerial Plant

Understanding the aerial portion of the plant and discussing ladder safety, proper climbing techniques and how to use a bucket truck



# Customer Service for Technicians

## OVERVIEW

Created specifically for the broadband industry, Customer Service for Technicians is a thorough guide for helping technicians deliver the highest levels of customer service. Designed to provide technicians with tools they can use immediately, the course covers the entire spectrum of customer service-related issues: developing customer service skills, proper communication techniques, customer account management, retention and loyalty, selling services, stress management, customer education and understanding advanced communication competition.

### **Delivery Options:**

 The course is delivered online.

### **Completion Time:**

Varies based on the student's self-study pace, however, the maximum time allowed is four months from the date of enrollment.

## BENEFITS

Upon completion students will:

- » learn how to immediately and positively affect customer satisfaction and loyalty rates
- » save repeat truck roll expenses by educating customers on premises equipment functions
- » reduce accounting expenses related to billing and customer database errors
- » receive an industry-recognized Jones/NCTI® certificate of graduation
- » use this course to help prepare for SCTE's Broadband Premises Installer certification

### **Ideal for:**

Technical personnel of any level, including:

- » installers
- » service technicians
- » technical field personnel
- » technical supervisors and management
- » technical support staff

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. describe techniques for overcoming communication obstacles and exhibiting professionalism when handling customers.
2. identify specific techniques for handling difficult customer service situations at the customer premises.
3. explain how to effectively demonstrate empathy when communicating with customers.
4. identify the obstacles associated with effective listening practices and explain how to overcome them.

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## RELATED COURSES

*Students completing this course should then enroll in:*

- » Broadband Digital Installer
- » Installer Technician
- » Consumer Digital Electronics

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and video rich course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

5. explain how to structure open and closed questions to deal effectively with a customer.
6. describe alternative words, phrases and behaviors to use when dealing with an irate or disappointed customer.
7. describe what needs to be done so customers perceive value in purchasing telecommunication services.
8. demonstrate the steps involved in selling telecommunications services.
9. list successful techniques for releasing stress and coping with stress in a positive manner.
10. describe stress relievers that can help in managing difficult situations.
11. identify methods for matching educational resources with learning styles.
12. determine if the customer has successfully learned how to operate the digital video service.
13. recognize recording limitations due to copy protection.
14. determine the level of customer education that should be provided to the high-speed data customer.
15. identify additional important points of education for IP voice customers in single and multi-family dwellings.
16. list ways an installation technician can ensure customer satisfaction in a small business IP voice installation.
17. describe the competitive role of all high-speed data providers.
18. outline the major effects of the Telecommunications Act of 1996 and the Digital Transition and Public Safety Act of 2005.

## COURSE OUTLINE

### 1. Providing Customer Service

Developing customer service skills, leading with customer service skills, maintaining accounts and up selling services, managing stress and educating the customer

### 2. Communicating Effectively

Using successful communication techniques, developing good listening techniques, using a clear tone of voice and practicing a confident telephone technique

### 3. Retaining Customers

Managing customer problems, responding to an irate customer and ensuring customer retention

### 4. Maintaining Customer Accounts

Keeping customer accounts, processing customer accounts, processing customer payments and managing customer data

### 5. Selling Broadband Services

Knowing your service offerings, organizing a sales kit, responding honestly, following the first-person principle, matching services to the customer's viewing interests and presenting features, benefits and value, greeting the customer, verifying information, identifying the type of call, identifying the customer's interests, building your presentation, recommending services, maintaining the customer's commitment, looking for buying signs, closing the sale, identifying the customer's concerns, addressing the customer's concerns and completing the sale

### 6. Managing Stress

Reducing the effects of stress, coping with stress and preventing burnout

### 7. Educating the Digital Video Customer

Preparing to educate the digital video customer, demonstrating digital video features and operating procedures, explaining key digital video concepts to the customer and handling difficult customer education situations

### 8. Educating the High-Speed Data and Voice Customer

Educating the high-speed data service customer, educating the IP Voice customer and providing customer service at IP Voice installations for small business

### 9. Understanding Competitive Services

Summarizing the competitive background, examining competing telecommunications services and bringing to light the value of cable



# Applying Wi-Fi Technologies

Part of both the **Master Representative** and **Telecom Specialist Certification Series**

## OVERVIEW

The NCTI® Applying Wi-Fi Technologies course teaches the broadband technician about the application of elements and principles that support installation and troubleshooting of Wi-Fi within the home, as well as in business environments. Wave propagation, channel assignment, interference, security and frequency bands, are just some of the fundamental topics technicians working in the Wi-Fi environment must understand. While Wi-Fi signals have become commonplace, there remains the need to understand the various ways devices receive and process Wi-Fi Data, troubleshoot interference and optimize Wi-Fi within the home or business. The Applying Wi-Fi Technologies course is appropriate for all Wi-Fi installation and troubleshooting technicians working in a Wi-Fi environment, offering fundamental as well as advanced topics.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated seat time for this course is 10 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Telecom Specialist certification
- » receive credit toward NCTI Master Installer certification

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify the types of radio waves and characteristics of frequency bands used in Wi-Fi
2. compare the features of the amendments to the IEEE standard 802.11
3. identify the components of a router used in the Wi-Fi network
4. analyze the characteristics of antennas used in Wi-Fi communications
5. explain the qualities of MIMO devices and how they are used to transmit and receive data
6. examine the types of security systems used to protect the Wi-Fi network
7. examine the router's configuration pages to recognize the settings on a wireless router
8. analyze channel selection and interference to ensure connection to a network
9. recognize how signal strength is expressed in Wi-Fi and how it affects speed and reliability

(Continued)



## RECOMMENDED PREREQUISITE

- » Installer
- » Computers and Broadband Modems

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Installer Technician
- » Troubleshooting Advanced Services

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials enhanced with online videos
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

10. examine the impact of interference and speed on the performance of a wireless network
11. describe Wi-Fi scanners and the information they display
12. describe how Wi-Fi spectrum analyzers are used to identify radio frequency activity in the 2.4 and 5 GHz bands
13. explain how site survey tools work
14. describe the factors used in the installation and placement of a gateway and/or router
15. describe the process for logging into a router and altering administrative settings
16. identify and configure Wi-Fi security
17. explain the difference between installing an additional access point and a wireless router
18. describe what considerations are used when deploying multiple access points
19. explain the methods used to improve signal strength
20. Describe the different Wi-Fi security features
21. Identify and explain SMB and enterprise hardware and software
22. Describe what steps are needed to improve poor signal strength
23. Identify the primary types of interference that affects Wi-Fi signal
24. Describe the types of non-Wi-Fi interference and troubleshooting solutions
25. Explain Wi-Fi devices speed processing capabilities

## COURSE OUTLINE

### 1. Wi-Fi Foundations

Explaining RF basics, reviewing 802.11 amendments, exploring wireless routers and gateways, reviewing antennas, exploring multiple input, multiple output (MIMO) and exploring Wi-Fi security

### 2. Understanding Wi-Fi

Understanding a router's settings, reviewing channels and interference, examining signal strength and discussing interference and speed

### 3. Wi-Fi Tools

Explaining Wi-Fi scanners, reviewing spectrum analyzers and exploring site survey tools

### 4. Installation of Residential Wi-Fi

Identifying gateway or router placement, setting up the wireless router, setting up Wi-Fi security and adding additional access points

### 5. Installation of Commercial Wi-Fi

Working with multiple access points, considering signal strength in a commercial environment, introducing enterprise Wi-Fi security, identifying SMB and enterprise hardware and software

### 6. Troubleshooting Wi-Fi

Troubleshooting Wi-Fi signal strength, examining Wi-Fi interference, examining non-Wi-Fi interference and examining client device capabilities



# Broadband Digital Installer

Part of the *Master Technician Certification Series*

## OVERVIEW

Broadband Digital Installer presents background information and installation practices pertaining to digital TV, Data over Cable Service Interface Specification (DOCSIS®) high-speed Internet, PacketCable™ telephone and home automation services for the connected home. Broadband professionals will be instructed on what is involved in certifying the reliability of the drop for digital TV, high-speed Internet and telephone service, as well as step-by-step installation procedures for each service. Because the DOCSIS and PacketCable technologies are unique to the broadband cable industry, the course provides extensive information about their origination and the advantages that each offers. The evolution of DOCSIS is detailed from its initial release through all versions including DOCSIS 3.1 and includes an explanation of what transpires in the background when a modem is being provisioned for service. Due to the rapid growth of and interest in home security and home automation within the broadband industry, this course covers the protocols that power the connected home as well as the connected home ecosystem.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 22 hours. The maximum allotted time is four months from the course enrollment date.

## BENEFITS

Upon completion students will:

- » receive an industry recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician Customer Premises certification
- » earn three hours of college credit

### **Ideal for:**

Broadband cable personnel who want to learn about installing digital TV, high-speed Internet access services, cable telephone service and home automation protocols, including:

- » installers and technicians
- » advanced services installers and technicians
- » high-speed data installers and technicians
- » telephone installers and technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain how the digital terminal adapter is used to deliver digital TV services
2. list the features of the different versions of DOCSIS through DOCSIS 3.1
3. describe the initialization and authorization process of a DOCSIS cable modem
4. describe how cable modem data is transported in the broadband cable network
5. describe the steps required to certify the reliability of a customer's cable drop system for cable modem and telephone services
6. describe how packet switching compares to circuit switching technology
7. specify the techniques, precautions, standards, options, tools and materials used when installing unshielded twisted-pair cable

(Continued)

## RECOMMENDED PREREQUISITE

» Installer

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Installer Technician
- » Computers and Broadband Modems
- » Troubleshooting Advanced Services
- » Consumer Digital Electronics

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

8. describe untwisted and twisted-pair cable, their color codes and their applications
9. describe the different categories and levels of twisted-pair cable
10. describe the different wiring configurations of twisted-pair cable at a jack and modular connector
11. compare the data rates of the different Wi-Fi® designations
12. describe how Multimedia over Coax Alliance (MoCA) is used in the home media network
13. describe home automation and its history
14. describe the differences between the ZigBee® and Z-Wave® communication process
15. identify and analyze different home automation platforms and their currently supported protocols
16. describe what must be considered during a cable telephone installation if the customer has a monitored alarm system

## COURSE OUTLINE

### 1. Installing Digital Television Services

Qualifying the signal for digital TV services; recognizing connection options, including direct, digital terminal adapter (DTA), digital set-top box (STB) and cable gateway and identifying consumer electronics in the home entertainment center

### 2. Introduction to DOCSIS

Detailing the origins of DOCSIS modems, the DOCSIS architecture, the DOCSIS equipment certification process; comparing DOCSIS to the OSI reference model; describing the different versions of DOCSIS, shared networks, DOCSIS transmissions, asymmetric data throughput and long-loop automatic gain control

### 3. DOCSIS Modem Operations

Obtaining DOCSIS single carrier RF operating parameters, obtaining DOCSIS 3.1 RF operating parameters, establishing an identity in the DOCSIS network and maintaining DOCSIS modem security

### 4. Installing a DOCSIS Modem

Qualify the cable drop for cable modem service, locating and activating the cable modem and educating the customer

### 5. Introducing VoIP

Exploring the world of VoIP, understanding cable telephony's evolution from constant bit rate (CBR) to VoIP and understanding how the PacketCable VoIP service differs from other VoIP services

### 6. Installing VoIP

Exploring VoIP pre-installation issues, installing the embedded multimedia terminal adaptor (EMTA) and connecting it into the customer's telephone network

### 7. Introducing Twisted-Pair Inside Wiring

Introducing the network interface device, untwisted and twisted-pair cables, twisted-pair cable hardware and routing topologies

### 8. Installing Twisted-Pair Inside Wiring

Pre-qualifying existing telephone and broadband services, describing twisted-pair installation tools, routing and attaching unshielded twisted-pair cable, adding a modular telephone jack, installing modular telephone line cord plugs and data plugs on unshielded twisted-pair cable

### 9. Installing the Home Media Network

Defining the media network and home automation protocols within the customer premises, introducing TV everywhere, discussing the Digital Living Network Alliance (DLNA), identifying the elements of the home media network, discussing Wi-Fi, HomePNA, HomePlug and MoCA technologies and defining the protocols that automate the Connected Home

### 10. Connected Home Transmission Technologies

Describing home automation and its history; identifying home automation protocols as well as the fundamental background of each, describing the communication process between the app, hub and home automation devices within the premises and describing home automation network topologies

### 11. Install VoIP in Homes with Electronic Security Systems

Understanding issues related to VoIP installations and electronic security system incompatibility, installing VoIP with a home security system and understanding VoIP problems with modem-type devices



# FTTx Basics

## OVERVIEW

The seemingly unquenchable demand for higher data speeds by consumers seems never ending. Fiber-to-the-“x” or fiber-to-the node, curb, business, home, premises, etc., is one way to quench this demand. Many broadband companies have dabbled with FTTx, in particular FTTH (fiber-to-the-home), and this trend is increasing in part due to competitive pressures. A company with technicians trained in FTTx is poised to take advantage of the growing demand for speed through fiber. The FTTx Basics course describes overall fiber-optic network architectures and provides in-depth step-by-step instructions for connecting a customer with a fiber-optic drop.

### **Delivery Options:**

 The course is delivered online and includes activities to promote learning. Lesson and final exams are taken online.

### **Completion Time:**

Varies based on the student’s self-study pace; however, the maximum time allowed is four months from date of enrollment.

## BENEFITS

Upon completion students will:

- » understand the process for fusion splicing fiber-optic cable
- » be able to effectively connect fiber-optic cable at the premises
- » become knowledgeable of passive optical networks (PON) architecture and equipment
- » understand the Radio frequency over glass (RfOG) standard
- » be able to complete fiber-to-the-home installations
- » receive an industry-recognized NCTI® certificate of graduation

### **Ideal for:**

Technical personnel supporting Fiber-to-the-“x” services, including:

- » installers
- » installer technicians
- » technical service representatives

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe the different “fiber-to-the-x” topologies used in broadband cable networks
2. describe a passive optical network
3. identify the different categories of fiber-optic cable that are used in a passive optical network
4. recognize the different topologies used in passive optical networks
5. explain how the radio frequency over glass (RfOG) standard operates with any passive optical network
6. identify the elements of a passive optical network
7. describe different applications for optical splitters
8. identify multiple fiber strands after a splitter on an OTDR trace
9. identify various connectors used with fiber-optic drops

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## RELATED COURSES

*Students completing this course should then enroll in:*

- » Broadband Digital Installer
- » Installer Technician

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and video rich course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## **COURSE OBJECTIVES** *(Continued)*

10. sequence the steps to prepare drop fiber for splicing
11. describe pigtails used for optical fiber terminations
12. describe the procedure for fusion splicing a drop fiber to a pigtail
13. identify the typical sources of failure in the outside plant
14. specify which fiber-optic test sets are used to troubleshoot common troubles
15. identify recommended fiber-optic restoration activities

## **COURSE OUTLINE**

### **1. Operational Procedures**

Introducing FTTx network topologies, describing passive optical network topologies, examining the elements of a passive optical network (PON), installing at the optical network unit (ONU) and troubleshooting FTTx installations



# Discovering DOCSIS – Customer Premises

## OVERVIEW

For many broadband cable operators DOCSIS has supplanted pay TV as their most popular and profitable service offering. To support the growth of this product all customer contact employees should have a thorough understanding of the DOCSIS product. The Discovering DOCSIS – Customer Premises minicourse is targeted to field and customer care center employees that install, service and support DOCSIS products inside the customer premises. Comprised of three lessons, the course details the evolution of DOCSIS beginning with DOCSIS 1.0 and continuing through DOCSIS 3.1 and explains what goes on in the background when a modem is provisioned for service. Orthogonal frequency division multiplexing (OFDM), the transmission system used in DOCSIS 3.1, is introduced and explained, preparing the student for the next generation of DOCSIS. Lastly, the course instructs the student on preparing the DOCSIS modem for installation, activating the DOCSIS modem in the customer premises and then educating the customer.

### ***Delivery Options:***

 This course is delivered online. Lesson and final exams are taken online.

### ***Completion Time:***

The estimated completion time for this course is 6 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » recognize how DOCSIS compares to the open systems interconnection (OSI) reference model
- » make the distinction between the features in the different versions of DOCSIS
- » learn how orthogonal frequency division multiplexing (OFDM) departs from legacy transmission systems
- » learn why asymmetric data rates are common
- » fully comprehend the initialization and authorization of a DOCSIS cable modem
- » recognize how DOCSIS modems establish their identity in the network and obtain their operating parameters
- » be able to install and activate a cable modem in the customer premises
- » provide the customer the appropriate amount of product education
- » receive an industry recognized NCTI certificate of graduation

### ***Ideal for:***

Broadband cable personnel who want to learn about DOCSIS enabled high-speed Internet access service, including:

- » installers and technicians
- » advanced services installers and technicians
- » high-speed data installers and technicians
- » customer care agents

## RECOMMENDED PREREQUISITE

- » Installer
- » Installer Tech

## RELATED COURSES

***Students completing this course should then enroll in:***

- » Digital Technician, High-Speed Data Installation
- » IP Voice
- » Introduction to Networking: Home and Peer-to-Peer Networks
- » Introduction to Networking: Local Area Networks

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing

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## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. describe the origins of the DOCSIS
2. identify the function of the major DOCSIS elements
3. explain the equipment certification process according to DOCSIS standards
4. explain how the DOCSIS network relates to the Internet protocol suite
5. list the features of the different versions of DOCSIS
6. describe the merits of DOCSIS 3.1
7. describe the initialization and authorization process of a DOCSIS cable modem
8. identify the client and the server in the DOCSIS architecture
9. describe how cable modem data is transported in the broadband cable network
10. instruct the customer how to most effectively use the newly installed high-speed broadband Internet access service
11. describe the steps required to certify the reliability of a customer's cable drop system for cable modem and telephone services

## COURSE OUTLINE

### 1. Introduction to DOCSIS

Details the origins of DOCSIS modems, the DOCSIS architecture, the DOCSIS equipment certification process, compares DOCSIS to the OSI reference model, describes the different versions of DOCSIS, shared networks, DOCSIS transmissions, asymmetric data throughput and long-loop automatic gain control

### 2. DOCSIS Modem Operations

Obtaining DOCSIS single carrier RF operating parameters, obtaining DOCSIS 3.1 RF operating parameters, establishing an identity in the DOCSIS network and maintaining DOCSIS modem security

### 3. Installing a DOCSIS Modem

Qualification of the cable drop for cable modem service, locating and activating the cable modem and educating the customer



# Advanced DOCSIS Operations

## OVERVIEW

The NCTI Advanced DOCSIS Operations course is directed to an audience of engineers and headend technicians who have responsibility for configuring and maintaining DOCSIS operations throughout the broadband cable network. The course provides an overview of DOCSIS 3.1 and catalysts for its development before going into detail about orthogonal frequency division multiplexing (OFDM) and how it is applied and configured for DOCSIS 3.1. The course explains key operational DOCSIS parameters that must be configured for operations and then monitored after the product is launched to broadband cable customers. Legacy DOCSIS versions share many of the same configurations with DOCSIS 3.1, which is built on top of the legacy DOCSIS architecture. Thus, this course offers value to students working with DOCSIS versions prior to 3.1 as well. Technicians will even learn about some lesser known features of DOCSIS 3.1, how to enable them and their benefit to the operator and customers.

### ***Delivery Options:***

 This is an e-learning course that is delivered completely online. Lesson and final exams are taken online.

### ***Completion Time:***

The estimated completion time for this course is 20 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Broadband cable personnel who want to learn about DOCSIS and are responsible for configuring and maintaining DOCSIS operations throughout the broadband cable network, including:

- » headend and hub technicians
- » area engineers
- » HFC network engineers/technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify and list the catalyst for DOCSIS 3.1
2. describe the DOCSIS architecture
3. describe how DOCSIS compares to the Open Systems Interconnection (OSI) reference model
4. describe how DOCSIS 3.1 shares the downstream frequency spectrum with previous DOCSIS versions
5. describe the DOCSIS 3.1 downstream radio frequency spectrum
6. describe how the RF downstream parameters of DOCSIS 3.1 compare to previous DOCSIS versions

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## RECOMMENDED PREREQUISITES

*Individuals taking this course should have experience working with hybrid fiber/coax (HFC) networks and DOCSIS modems. It is suggested that the following courses be completed prior to taking this Advanced DOCSIS Operations course:*

- » Discovering DOCSIS: Customer Premises
- » Internetworking with TCP/IP
- » Advanced Technician
- » Digital Technician

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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## COURSE OBJECTIVES *(Continued)*

7. describe the anatomy of the DOCSIS 3.1 downstream channel
8. describe which DOCSIS 3.1 downstream channel parameters need to be optimized for reliable operations
9. describe how DOCSIS 3.1 can adapt to varying network conditions
10. explain how DOCSIS 3.1 downstream and upstream profiles are crafted
11. describe how DOCSIS 3.1 modems acquire their respective profiles
12. describe the configuration settings that must be made in order to operate DOCSIS 3.1 while using legacy versions of DOCSIS modems
13. describe Time and Frequency Division Multiplexing and how they can be combined for efficient spectrum usage
14. explain the bonding of single carrier channels with orthogonal frequency division multiplexing (OFDM) channels
15. list the downstream and upstream Proactive Network Maintenance Metrics to enhance network reliability
16. explain how a fast Fourier transform is used and applied to OFDM
17. recognize the significance of some key cable modem termination system (CMTS) configurations
18. describe how DOCSIS service groups are built

## COURSE OUTLINE

### **1. Deploying DOCSIS 3.1**

Identifying catalysts for DOCSIS 3.1, reviewing the DOCSIS 3.1 architecture and comparing DOCSIS to the OSI reference model

### **2. Configuring DOCSIS 3.1**

#### **Downstream Subcarriers**

Defining the DOCSIS 3.1 downstream RF framework, categorizing the DOCSIS 3.1 OFDM downstream subcarriers and optimizing the downstream channels

### **3. Creating Downstream Profiles**

Adapting to varying network conditions, crafting downstream profiles and obtaining downstream profiles

### **4. Configuring for Backward Compatibility**

Maximizing the spectrum of DOCSIS 3.1 and legacy devices and examining DOCSIS 3.1 migration strategies

### **5. Introducing Proactive Network Maintenance**

Instilling proactive network maintenance, examining how proactive network maintenance works and reviewing proactive network maintenance case studies

### **6. Building Service Groups**

Reviewing cable network architecture, describing how service groups are built and reviewing a more complex cable configuration example



# Full Duplex DOCSIS

## OVERVIEW

With distributed access architecture (DAA) development underway, CableLabs® engineers working on the 3.1 version of the Data Over Cable Service Interface Specification (DOCSIS®) saw an opportunity that leverages DAA to enhance upstream capacity. The resultant Full Duplex (FDX) DOCSIS specification defines simultaneous upstream and downstream communications for symmetrical upstream and downstream data rate capacity. The NCTI Full Duplex DOCSIS course teaches the broadband technician about interferences unique to FDX operation and how these interferences are addressed. The course also explains the difference between full duplex operation and frequency division duplexing, and how both are used for FDX DOCSIS 3.1 operations. Completing the NCTI FDX DOCSIS course prepares the broadband technician for when FDX DOCSIS 3.1 operations are launched in their network.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 4 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » prepare for implementation of Full Duplex DOCSIS 3.1
- » understand concepts of full duplex communications
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Anyone whose system is considering or already implementing DOCSIS 3.1 full duplex operation

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. list reasons for Full Duplex DOCSIS 3.1 deployment
2. define what full duplex operation is
3. identify the frequency band allocated for Full Duplex DOCSIS 3.1 operations
4. describe what is required of a fiber node for full duplex operation
5. describe DOCSIS 3.1 FDX-Limited modems
6. describe how interference groups are used to limit interference between full duplex modems
7. describe the sounding process and hierarchy of resource block assignments, transmission groups to manage traffic in full duplex interference groups
8. describe echo cancellation at the node
9. describe how adjacent leakage interference and adjacent channel interference at the modem is suppressed with echo cancellation

## RECOMMENDED PREREQUISITE

- » Advanced DOCSIS Operations

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials enhanced with online videos
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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## COURSE OUTLINE

### 1. Implementing Full Duplex DOCSIS 3.1

Weighing full duplex operations, identifying the full duplex frequency spectrum, recognizing full duplex downstream and upstream power levels

### 2. Enabling Full Duplex Operation

Defining interference groups, discovering interference groups, suppressing echoes in the FDX fiber node and addressing interference in FDX modems



# Troubleshooting Advanced Services

Part of the *Master Technician Certification Series*

## OVERVIEW

The Troubleshooting Advanced Services course builds on the knowledge acquired in the Broadband Digital Installer course and complements it with a focus on troubleshooting. The three main service areas of a cable operator are covered in the Troubleshooting Advanced Services course: digital video, data/Wi-Fi and voice. The course is geared to troubleshoot at the customer premises and teaches real world processes that the student can use in a real work environment. Scenarios are presented for addressing specific issues of triple-play services at the premises, as well as the philosophy, mindset and attitude of a successful troubleshooter that can be applied to any circumstance.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 16 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician certification
- » use this course to help prepare for SCTE's Broadband Premises Installer, Broadband Premises Technician and Broadband Telecom Center Specialist certifications

### **Ideal for:**

Personnel assigned to troubleshoot and repair products or services in the customer home, such as:

- » trouble call technicians
- » installers

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain the mindset and most effective techniques to troubleshoot digital television service.
2. explain how the set-top box is used to deliver digital television service and identify some common service problems related to set-top boxes.
3. identify the primary quality benchmarks of a quadrature amplitude modulation channel and digital television service.
4. identify the various artifacts that can be seen in the video of a digital television channel and recognize the likely source of the artifacts.

(Continued)

## RECOMMENDED PREREQUISITES

- » Broadband Digital Installer

## RELATED COURSES

*Students completing this course should then enroll in:*

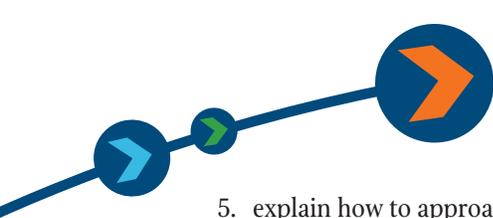
- » Applying Wi-Fi Technologies

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





5. explain how to approach troubleshooting Internet protocol television.
6. describe some of the issues that can occur with the high-definition multimedia interface.
7. identify the measurements that quantify the quality of a digital modulation channel.
8. identify test instruments for measuring digital modulation channel parameters.
9. diagnose digital modulation measurements that indicate issues.
10. explain the features of the DOCSIS architecture and how it affects data transmission.
11. discuss the primary features of DOCSIS 3.0 and 3.1.
12. describe the methods of troubleshooting in the customer premises.
13. describe what steps are taken when improving poor signal strength.
14. identify the primary types of interference that affects Wi-Fi signal.
15. describe the types of non-Wi-Fi interference and troubleshooting solutions.
16. explain Wi-Fi devices speed processing capabilities.
17. identify the common telephone wiring defects that can occur and how to safely troubleshoot them.
18. identify the features and characteristics of twisted-pair wiring.
19. describe the techniques used to troubleshoot twisted-pair wiring problems.
20. describe the use of twisted-pair IW test equipment and common procedures for troubleshooting IW problems.
21. describe the use of a tone generator and inductive amplifier probe to troubleshoot wiring problems.
22. describing the use of a twisted-pair cable tester and procedures for troubleshooting wiring problems.

## COURSE OUTLINE

- 1. Troubleshooting Digital Television Service**  
Assessing the digital television troubleshooting process, troubleshooting the set-top box and assessing the quadrature amplitude modulation channel
- 2. Troubleshooting the Digital Video Experience**  
Assessing digital television, addressing internet protocol television and assessing customer premises equipment interface problems
- 3. Quantifying Digital Channel Quality**  
Defining digital measurements, considering digital modulation test instruments and interpreting digital modulation measurements
- 4. Troubleshooting High-Speed Data Service**  
Delivering high-speed data service, detailing the evolution of docsis and resolving problems in the customer premises
- 5. Troubleshooting Wi-Fi**  
Troubleshooting Wi-Fi signal strength, examining Wi-Fi interference, examining non Wi-Fi interference and examining client device capabilities
- 6. Troubleshooting Telephone Wiring and Twisted-Pair Cable**  
Identifying telephone wiring problems, describing twisted-pair wiring problems and troubleshooting twisted-pair wiring
- 7. Using Twisted Pair Inside Wiring Test Equipment**  
Using telephone test sets, using a tone generator and inductive amplifier probe and using a twisted-pair cable tester
- 8. Troubleshooting IP Voice**  
Understanding how to troubleshoot IP Voice service, examining the embedded multimedia terminal adapter and diagnosing IP Voice service problems



# Computers and Broadband Modems

Part of the *Master Technician Certification Series*

## OVERVIEW

Computers and Broadband Modems introduces the fundamentals of personal computer (PC) hardware and software in connection with DOCSIS® cable modems. Students completing this course gain a thorough understanding of how the PC and modem interface with the broadband cable network. Topics of study include a detailed description of the major components in a PC and how they interact in the computer system; a review of Microsoft Windows, Apple and Linux operating systems with explanations of their respective features and vulnerabilities; an overview of mobile devices and their operating systems; wireless networks, Wi-Fi and Bluetooth; computer security and an introduction to DOCSIS cable mobiles and their installation.

Delivered online, the course includes videos and activities that are intended to help the student retain key points of information. The videos are hosted by Mike Meyers, author and holder of multiple IT industry certifications, whose colorful and humorous teaching makes the course both entertaining and effective. The Computers and Broadband Modems course is an excellent reference for the student learning about computer concepts and terminology. However, the cable modem lessons assume prior technical knowledge.

### **Delivery Options:**

 The course is delivered online with in-course activities to promote learning. Lesson and final exams are also taken online.

### **Completion Time:**

Varies based on the student's self-study pace, however, the maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » effectively troubleshoot basic personal computer problems
- » recognize the capabilities and limitations of the different Windows, Apple and Linux operating systems
- » thoroughly educate new high-speed data customers on their wired and wireless connected equipment's operation
- » understand the functions of the different computer modules and how they interact together
- » educate high speed data customers on options to protect their equipment from malware and other security related concerns
- » prepare students for customer questions that arise with respect to the different computer and mobile device operating systems.
- » have a more complete understanding of DOCSIS modems
- » understand how to complete advanced, high-speed data installations
- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician certification

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Troubleshooting Advanced Services
- ~ or ~
- » Telephone Home Wiring
- » Installer Technician

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





***Ideal for:***

Technical personnel supporting Internet-based services, including:

- » installers
- » installer technicians
- » technical service representatives

## **COURSE OBJECTIVES**

Upon completing this course, the student will be able to:

1. identify the main components of a computer system
2. describe how to maneuver in the different Windows operating systems to perform common tasks
3. explain the meaning of 32- and 64-bit processing
4. explain the labeling of the different types of random access memory (RAM)
5. describe the basic input/output services (BIOS) in a computer system
6. describe the computer motherboard and the different available form factors
7. list important considerations when choosing a computer power supply
8. describe a traditional hard drive and a solid state drive
9. identify different types of media for storing and playing back data
10. explain how to configure common input devices in a computer system
11. understand the terms resolution, refresh rate and color depth as they relate to a computer's video configurations
12. describe the terms Transmission Control Protocol (TCP), User Datagram Protocol (UDP) and ports in reference to Internet applications
13. describe the waveform audio file format (WAV) and musical instrument digital interface (MIDI) file formats
14. identify different laptop types and features that make laptops versatile
15. describe mobile device operating systems
16. identify how to keep computer systems in an optimal operating condition
17. connect and troubleshoot Wi-Fi networks
18. describe the DOCSIS standard and how it originated
19. describe the initialization and authorization process of a DOCSIS cable modem

## **COURSE OUTLINE**

### **1. Operational Procedures**

Discuss professionalism in appearance and communications, identify the biggest hazards to a computer and discuss safety for those working on a computer and for the computer while being worked on

### **2. The Visible PC**

Review how computers work, identify and explain the function of the main components inside a computer and describe the different computer interfaces to peripheral devices

### **3. Visible Windows**

Introduction to operating systems and touring operating systems

### **4. Microprocessors**

Understanding central processing units (CPU), investigating CPU speeds and cores, exploring CPU caches, understanding 32-bit and 64-bit processors, installing a CPU and cooling a CPU

### **5. Random Access Memory (RAM)**

Understanding RAM, looking at types of RAM, adding RAM to a system, troubleshooting RAM and understanding virtual memory

### **6. Basic Input/Output Services (BIOS)**

Defining the purpose of BIOS, describing the power-on self-test (POST) and troubleshooting BIOS

### **7. Motherboards**

Understanding form factor, ATX and ITX form factors, chipsets, the expansion bus, installing a motherboard and configuring for two CPUs

### **8. Power Supplies**

Electricity basics, describing the power supply and connections, choosing a power supply, power protection and troubleshooting the power supply

### **9. Hard Drive Technologies**

Introduction to hard drive technologies including solid state drives

*(Continued)*



## COURSE OUTLINE *(Continued)*

### **10. Removable Media**

Remembering floppy discs and drives, investigating optical drives and flash media

### **11. Input Devices**

Supporting common ports and connecting input devices

### **12. Video**

Investigating video displays, connectors and video settings, working with projectors, setting up multiple monitors, installing graphics cards and troubleshooting video issues

### **13. The Internet**

Understanding Internet tier structures, connecting to the Internet, investigating Internet application protocols and analyzing Internet issues

### **14. Multimedia**

Recognizing sound file formats, working with volume and using tuners and video cards

### **15. Wireless Networking**

Introduction to wireless networking

### **16. Portable Computing**

Looking at laptop computers, managing and maintain portable computers and troubleshooting laptop computers

### **17. Mobile Devices**

Comparing smart phones and tablets, describe mobile operating systems, syncing mobile devices, connecting mobile devices to a network, connecting mobile devices to email and securing mobile devices

### **18. Securing Computers**

Exploring physical security, securing the environment against unauthorized use and against software threats, using firewalls, destroying data and complying with acceptable use policies

### **19. Introduction to DOCSIS**

An overview of the origins of DOCSIS modems, the DOCSIS architecture, the different versions of DOCSIS including DOCSIS 3.1 and the initialization and authorization of a DOCSIS modem

### **20. Installing a DOCSIS Modem**

Qualification of the cable drop for cable modem service, suggestions to reduce upstream noise, locating and activating the cable modem and educating the customer



# IP Voice

## OVERVIEW

The IP Voice course is comprised of four sections covering the delivery of telephone service using Voice over Internet (VoIP) technology through broadband cable's managed network. The IP Voice course uses full-motion video and animation to closely mirror a hands-on learning environment. The video provides detailed and realistic demonstrations of the critical skills needed by an installer to successfully deliver voice service. Learners ride along with an installer as he takes them step-by-step through all the aspects of IP Voice service, including: preparation, installation in single- and multi-dwelling units, homes with security systems, troubleshooting and safety. This well-rounded approach to understanding IP Voice services ensures learners comprehend both the how and why of the job they are performing.

### ***Delivery Options:***

 All learning, lessons and final exams are delivered and taken online.

### ***Completion Time:***

The estimated completion time for this course is 8 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion, students:

- » use this course to help prepare for SCTE's Broadband Premises Installer certification
- » receive an industry recognized NCTI certificate of graduation

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. define and describe IP Voice service
2. describe and identify the tools and equipment used to deliver IP Voice service
3. identify types of wiring commonly used in IP Voice installations
4. describe the two basic types of house wiring schemes
5. describe what must be addressed before or during the installation of IP Voice
6. describe the process for installing and activating the embedded multimedia terminal adapter (EMTA) and connecting it into the existing premises wiring
7. explain how to install IP Voice in a customer premises with a monitored alarm system
8. explain basic rules of how to troubleshoot various IP Voice service problems

## RECOMMENDED PREREQUISITE

- » Installer

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Video-rich and interactive course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.



(Continued)



## COURSE OUTLINE

### 1. Introduction to IP Voice

Introducing IP Voice as the cable industries' Voice over Internet Protocol (VoIP) solution that is comparable to that of the legacy telephone providers, explaining the conversion of analog voice to data packets and the packet's delivery over the cable operator's private IP network, explaining the benefits and features of using the PacketCable™ architecture, introducing the embedded multimedia terminal adapter (EMTA), discussing EMTA function and operating requirements, listing, describing, providing and demonstrating the basic hand tools, test equipment, wiring and hardware used during an IP Voice installation and describing the different types, categories and components of twisted-pair cable and wiring polarity

### 2. Preparing to Install IP Voice

Describing what to check on the work order, listing what should be in the truck before leaving the office each day, defining customer service and interactions between the installer and the customer from the initial meeting to the closing of the work order, describing how e911 emergency services work with IP Voice and explaining it to the customer

### 3. Installing IP Voice

Explaining how to safely follow step-by-step installation procedures at the tap, ground block and in the customer premises, recognizing causes of problems in the coaxial cable drop system, describing how to prevent problems, measuring and recording signal levels, replacing F-connectors, installing drop tags and the EMTA into the existing premises wiring and toning, testing the wiring to identify its routing, learning how and when to use straight through and crossover jumpers and verifying that the service is installed and working properly

### 4. Special Situations

Explaining how IP Voice and the EMTA is to be connected into monitored security alarm systems, learning about potential alarm system problems and how to avoid them, describing the EMTA installation in an MDU along with installation restrictions and possible solutions, troubleshooting an IP Voice service with no dial tone, noise on the line and continuous dial tone, describing some of the test equipment used to troubleshoot wiring problems and common wiring errors and learning about different devices to test and troubleshoot IP Voice problems



# Business Services for Technicians

Part of the *Master Technician Certification Series*

## OVERVIEW

The NCTI Business Services for Technicians course teaches the broadband technician about the application of elements and principles that support installation and troubleshooting of business class services. This course covers business class services such as data, video and voice installation and troubleshooting. The Business Services for Technicians course is appropriate for all business class technicians working in the small, medium or large business environment, offering fundamental as well as advanced topics

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 10 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Senior Master Technician certification

### **Ideal for:**

- » Commercial Installation Technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain the concepts of business class services, including how each type of service can differ in installation practices
2. describe preparation techniques and documents to prepare for a customer visit
3. identify components of a site survey equipment used to survey different types of buildings
4. explain how drops, bonding, grounding demarcation points work within a business installation
5. describe best practices when working with equipment commonly found in businesses and equipment room locations
6. identify processes, components, devices terminology of data networks in businesses
7. describe how types of data installations and installation techniques are used to make certain the business class services are properly working
8. describe the process for troubleshooting a business data installation, including creating problem statements and using troubleshooting tools
9. identify the characteristics of commercial video distribution methods and local content video insertion
10. examine the best equipment and installation methods to use for a seamless and efficient video service installation

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Broadband Digital Installer
- » IP Voice
- » Applying Wi-Fi Technologies
- » Troubleshooting Advanced Services

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Interactive eLearning with videos, animations, activities engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## **COURSE OBJECTIVES** *(Continued)*

11. describe best practices for verifying the installation is successful
12. identify the best approach when troubleshooting business class video service
13. explain how legacy and present-day telephone systems operate in businesses
14. examine best practices and processes for installing business class voice service
15. explain business class voice troubleshooting
16. describe the process and appropriate steps to take when troubleshooting a business class voice service installation
17. explain the methods used to improve signal strength in a commercial environment
18. examine the different enterprise Wi-Fi security features used in commercial Wi-Fi
19. explain the features of SMB and enterprise hardware and software in a commercial environment

## **COURSE OUTLINE**

### **1. Introducing Business Class Services**

Explores the components of business class services beginning with an explanation of the key concepts of business class services, including working with customers to provide problem support and excellent service

### **2. Business Class Data**

Explores the major differences between business class data installations and residential installations, including the unique equipment and tools available for use, how to route cables and verify services how to utilize troubleshooting techniques as well as collaboration to solve customer issues

### **3. Business Class Video**

Describes the methods of commercial video distribution and insertion, the different components of performing the installation from completing a thorough site survey, using the proper equipment, ensuring there is a sound configuration verifying the installation prior to handing off the project to the customer

### **4. Business Class Voice**

Examines the legacy telephone systems, alternative telephone technologies equipment and cabling that makes it all work. Since business class voice service installation can become quite complex, the lesson describes the components and processes involved in the installation

### **5. Installation of Commercial Wi-Fi**

Working with multiple access points, considering signal strength in a commercial environment, introducing enterprise Wi-Fi security, identifying SMB and enterprise hardware and software



# High-Speed Data Installation

## OVERVIEW

The High-Speed Data Installation course introduces the fundamentals of high-speed data Internet access service by presenting the typical features and functions of cable modems. The student will gain a thorough understanding of how the PC and modem interface with the broadband network. Topics of study include DOCSIS in the network, cable modem provisioning, the role of the cable modem termination system (CMTS) and more. The student will also learn how to effectively educate customers on high-speed service.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is 8 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion, students:

- » use this course to help prepare for SCTE's Broadband Premises Installer certification
- » receive an industry recognized NCTI certificate of graduation

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. define and describe high-speed data service
2. define and describe cable modem system components
3. identify and choose the correct tools and equipment used in high-speed data service installations
4. interact professionally with the customer
5. perform an interior and exterior site survey before installing high-speed data service
6. locate and mitigate ingress and egress
7. choose the correct tools and equipment for the installation of high-speed data service
8. set up a customer high-speed data and e-mail account
9. activate an EMTA for high-speed data service
10. describe the classifications, properties, wiring schemes and components of twisted-pair cable
11. attach a modular RJ-45 plug to a twisted-pair cable
12. rewire an RJ-45 wall jack
13. troubleshoot twisted-pair high-speed data installations
14. connect multiple devices to a single cable modem Internet connection
15. recognize basic modem emulator functions
16. interpret information obtained by a modem emulator
17. use a modem emulator to conduct a return test
18. list devices that can conduct a return test
19. apply the divide and conquer troubleshooting method

(Continued)

## RECOMMENDED PREREQUISITE

- » Installer

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly interactive video simulations and animations
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

20. describe house amplifiers and their properties
21. connect a wireless router
22. describe packet loss
23. recognize HSD modem requirements

## COURSE OUTLINE

### 1. Introduction to High-Speed Data

Introducing the high-speed data product and its value to the cable operator; describing promotions and premium services, defining the competition; and inspect and operate a company vehicle in a professional manner

### 2. Upgrading to High-Speed Data Service

Review good customer practices and skills, qualifying the signal at the wall outlet for high-speed data service, inspecting a drop to ensure compliance with company and industry standards, identifying equipment needed to install high-speed data service, attaching the cable modem to customer premises equipment, describing twisted-pair Ethernet cables, activating the cable modem for high-speed data service, verifying high-speed data service and providing high-speed data service customer education

### 3. Activating an EMTA for High-Speed Data Service

Gathering the equipment for twisted-pair service, describing an EMTA, identifying the MAC address for EMTA registration, describing twisted-pair cable test equipment, identifying a twisted-pair line, distinguishing between a straight-through and crossover twisted-pair cable, identifying twisted pair cable plugs and jacks, identifying twisted-pair handling practices, identifying twisted-pair wiring errors, connecting customer premises equipment to the EMTA and connecting the EMTA to the computer

### 4. Troubleshooting High-Speed Data Service

Probing the customer to learn more about the problem, using a cable modem emulator to troubleshoot, identifying and resolving high-speed data problems, recognizing proper application of house amplifiers and connecting a wireless router to a cable modem



# Installer Technician

Part of the *Master Technician Certification Series*

## OVERVIEW

The NCTI Installer Technician course focuses on maintaining reliability in the installed drop system. The electronic theory provides the foundation for understanding decibels, signal leakage detection and troubleshooting techniques. A basic mathematics review helps the student with equations and formulas relating to basic electronic theory and signal level. Also covered are topics on how to detect and troubleshoot signal leakage in the VHF and UHF frequency bands including LTE frequencies. The course concludes with the basic characteristics and functions of line extender amplifiers and a discussion of government regulations and ways to comply with industry rules.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

Varies based on the student's self-study pace, however, the maximum time allowed is six months from enrollment.

## BENEFITS

Upon completion students will:

- » correctly troubleshoot and maintain the installed drop system
- » utilize mathematical equations and formulas related to installed cable systems
- » identify, locate and repair common problems from premises to the tap
- » use this course to help prepare for SCTE's Broadband Premises Installer and Broadband Distribution Specialist certifications
- » earn four hours of college credit
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician certification

### **Ideal for:**

Technical personnel, including:

- » installers
- » maintenance technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand and apply basic DC electronic theory, perform Ohm's law calculations and discuss relevant broadband cable applications
2. perform basic cable math calculations
3. explain dB and dBmV fundamentals and broadband cable applications and perform gain and loss calculations
4. recognize the impact of signal leakage and use a signal leakage detector to identify and troubleshoot signal leakage from the tap into the customer premises
5. identify, locate and repair common problems from the customer premises

(Continued)

## RECOMMENDED PREREQUISITE

- » Installer

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Service Technician
- » Return Path Operations
- » Consumer Digital Electronics

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials enhanced with online videos
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

- equipment to the tap in both single dwellings and MDUs
6. understand the theory of operation of line extender amplifiers and explain the functions of amplifier passives and actives
  7. identify the role of national and international organizations in establishing and implementing telecommunications standards

## COURSE OUTLINE

- 1. Exploring Electrons and Electricity**  
Establishing electron characteristics, identifying element categories, understanding electron current flow, electric current, electrical force and using units of electrical measurement
- 2. Understanding Magnetism and Electromagnetism**  
Looking at the history and theory of magnetism and electromagnetism and exploring magnetic and electromagnetic applications
- 3. Using Positive and Negative Numbers, Decimals and Fractions**  
Reviewing positive and negative numbers and understanding common and decimal fractions
- 4. Examining Equations and Powers of Numbers**  
Examining equations and powers of numbers
- 5. Understanding Electrical Circuits**  
Understanding circuit essentials, differentiating current flow conditions, defining current types and understanding circuit graphics
- 6. Understanding Resistance**  
Understanding, changing and controlling resistance
- 7. Using Ohm's Law for Power and Energy**  
Describing basic electrical characteristics, working with Ohm's law, solving power equations and solving an energy equation
- 8. DC Series Circuits**  
Circuit requirements, characteristics and calculations
- 9. Understanding Decibels**  
Reviewing the history of decibels, making comparisons between two values, explaining the concept of bels and decibels and understanding power and voltage ratios
- 10. Using dB and dBmV**  
Working with dBmV and performing signal level calculations
- 11. Detecting Signal Leakage**  
Reviewing signal leakage basics, selecting and operating signal leakage detection equipment and eliminating signal leakage
- 12. Thinking Skills for Troubleshooting**  
Preparing your mental processes for troubleshooting and discussing how to think when troubleshooting a problem
- 13. Communication Skills for Troubleshooting**  
Identifying soft communication skills, understanding the importance of spoken and unspoken communications and learning how to listen
- 14. Troubleshooting Coaxial Cables and Connectors**  
Describing the drop and inside wire elements, understanding coaxial cable test equipment and explaining how to install connectors
- 15. Troubleshooting Fiber-Optic Cables and Connectors**  
Discussing characteristics of fiber-optic cable and examining how to troubleshoot problems and repair fiber-optic cable and components
- 16. Troubleshooting Drop Splitters, DCs and Drop Amps**  
Examining splitter and directional coupler problems and discussing basic troubleshooting techniques for drop amplifiers
- 17. Troubleshooting Ingress and Egress**  
Understanding ingress and egress, examining ways to isolate and diagnose the cause of ingress and examining UHF signal leakage and ingress
- 18. Troubleshooting Inside Wiring, Powering Elements and Bonding**  
Identifying insider wiring plugs and jacks, understanding how to troubleshoot inside wiring, power cables and connectors
- 19. Line Extender Amplifier Operation**  
Examining amplifier housing, line extender AC/DC powering systems, RF passives and controls and amplifier modules and discussing the classification of line extender specifications
- 20. Understanding Broadband Cable Regulatory Issues**  
Identifying government regulation, examining how technical performance is regulated and understanding how to comply with industry rules



# Introduction to Telecom Operations

Part of the **Telecom Specialist Certification Series**

## OVERVIEW

The Introduction to Telecom Operations course is designed for the telecom technician. Copper pair networks can provide modern services over an infrastructure that is over a century old, while still providing plain old telephone service (POTS). The course explains basic safety practices according to OSHA, and basic electronics such as voltage, power, current and resistance. These electronic principles are foundational to the understanding of how a copper network works. In addition to POTS, the course teaches installation and troubleshooting of digital subscriber line (DSL), voice over IP (VoIP) and passive optical network (PON) fiber to the premises (FTTP).

### **Delivery Options:**

 This course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 16 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Telecom Specialist certification

### **Ideal for:**

Anyone wanting to be a valued company asset by knowing how to service all installation and repair technician aspects of a telecom network.

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. examine the proper use of personal protective equipment (PPE) and how to inspect them
2. describe the features of the foreign voltage detector and how to use it to detect electrical hazards
3. describe the characteristics of the various types of ladders and pole climbing equipment and how to safely use them
4. outline company vehicle use and distracted driving guidelines
5. describe the features of a bucket truck and safety practices when working in and around manholes
6. convert volts, amperes, ohms and watts into values using scientific notation and metric prefixes
7. explain how to use Ohm's law to perform calculations
8. identify equations used to perform various power calculations
9. examine the types and behaviors of copper cable designs and how installation affects the design
10. compare DSL components and how they have improved over time

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

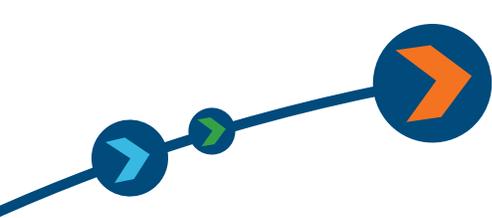
- » Telephone Home Wiring
- » Applying Wi-Fi Technologies

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





11. analyze DSL network design and components and how they operate together to deliver Internet traffic to the subscriber
12. examine the features of a passive optical network and how it improves the speed of the network service to the customer
13. identify best practices for installing small diameter conductors and how terminals are used at the central office
14. explain the characteristics of the main distribution frame and how to place jumpers in the MDF
15. describe the purpose and characteristics of the cross-connect box, how to make terminations and how to install jumpers
16. describe the types and characteristics of serving terminals and best practices for accessing them at the customer's drop
17. examine the function, features and layout of the network interface device and how to properly install it to the customer premises
18. identify the different types of inside wiring and how to correctly install wiring and jacks
19. identify the different types of DSL modems and how to place, install and configure the modems to match customer circuit settings
20. explain the features of POTS and best practices for installing a telephone that is working properly
21. examine the technology for VoIP used for transporting telephone conversations
22. explain troubleshooting processes for Internet, POTS and VoIP services
23. explain how to test and troubleshoot AC and DC voltage, resistance, capacitance, longitudinal balance, load coil and bridged tap
24. describe how to perform DSL synchronization, wideband spectral analysis and wideband impulse noise testing and determine pass/fail results
25. describe how to trouble isolate and resolve in-home or central office issues
26. describe how to isolate and resolve trouble to LAN or WAN
27. describe how to isolate and resolve trouble to digital subscriber line access multiplexer or modems

## COURSE OUTLINE

- 1. Operational Safety**  
Examining personal protective equipment, evaluating the foreign voltage detector, evaluating ladder safety, evaluating pole climbing safety equipment, using a bucket truck, manhole safety and analyzing company vehicle use
- 2. Using Ohm's Law for Power and Energy**  
Describing basic electrical characteristics, working with ohm's law and solving power equations
- 3. Copper Cable and Network Design**  
Copper cable design and copper cable network design
- 4. Digital Subscriber Line and Passive Optical Networks**  
Telecom operations, DSL network design and components and passive optical network topologies
- 5. Service Installation: Central Office to Cross-Connect Box**  
Installing and connecting wires, main distribution frame and jumper installation and cross-connect box and jumper installation
- 6. Service Installation: Serving Terminals to Network Interface Device**  
Serving terminals, installing drops and network interface device installation
- 7. In-Home Installation**  
Inside twisted copper and jack installation, DSL modem installation, plain old telephone service installation, voice over Internet protocol, installation tools and service test and quality check
- 8. Basic Maintenance and Repair**  
Narrowband/physical equipment test and results analysis, broadband/DSL test equipment and results analysis, inside or outside trouble isolation and resolution, LAN or WAN trouble isolation and resolution and DSLAM and DSL modem trouble isolation and resolution



# Telephone Home Wiring

Part of the *Telecom Specialist Certification Series*

## OVERVIEW

Telephone Home Wiring teaches technicians how to correctly install and troubleshoot the hardware associated with an in-home telephone system. This hardware includes various twisted-pair transport media, interface devices and termination points. The technician is introduced to inside wiring topologies, cable and connector configurations, Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA) standards and twisted-pair test equipment. Additionally, extensive troubleshooting of twisted-pair wiring is presented to ensure the technician is able to solve telephony related issues within the premises.

### **Delivery Options:**

 Learning takes place online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 8 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » be better prepared to troubleshoot twisted-pair wiring issues in the home
- » reduce repeat service calls and improve customer satisfaction
- » use this course to help prepare for SCTE's Broadband Premises Installer certification
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Telecom Specialist certification

### **Ideal for:**

Personnel, who need to learn about installing telephone home wiring, including:

- » installers and technicians
- » advanced services installers and technicians
- » high-speed Internet installers and technicians
- » telephone installers and technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe untwisted-pair and twisted-pair telephone wire, their applications and their color code
2. explain the purpose and applications of the American National Standards Institute (ANSI)/TIA/EIA-570B Residential Telecommunications Infrastructure Standard
3. install modular plugs/jacks on inside wiring data cables using ANSI/TIA/EIA-T568-A and T568-B wiring configurations
4. identify the characteristics of shorts and crosses, and open circuits within a twisted-pair inside wiring system
5. describe three types of twisted-pair inside wiring errors
6. describe wiring topologies commonly used for twisted-pair inside wiring
7. use a tone generator and an inductive amplifier probe to perform a telephone line test/polarity test and identify twisted-pair conductors

(Continued)

## RECOMMENDED PREREQUISITES

- » IP Voice

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Installer Technician
- » Broadband Digital Installer
- » Computers and Broadband Modems
- » Understanding Voice and Data Networks

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## **COURSE OBJECTIVES** *(Continued)*

8. use a twisted-pair cable tester to test circuit faults on twisted-pair cable utilizing one of three different wiring configurations and interpret test results

## **COURSE OUTLINE**

### **1. Introducing Twisted-Pair Inside Wiring**

Introducing the network interface device, untwisted and twisted-pair cables, twisted-pair cable hardware and routing topologies

### **2. Installing Twisted-Pair Inside Wiring**

Pre-qualifying existing telephone and broadband services, describing twisted-pair installation tools, routing and attaching unshielded twisted pair (UTP), adding a modular telephone jack and installing modular telephone line cord plugs and data plugs on UTP cable

### **3. Troubleshooting Telephone Wiring and Twisted-Pair Inside Wiring**

Identifying problems and symptoms, describing twisted-pair wiring problem causes and troubleshooting

### **4. Using Twisted-Pair Inside Wiring Test Equipment**

Explaining how to use telephone test sets, a tone generator and inductive amplifier probe, a twisted-pair cable tester, a modular cable tester and introducing the wiremap test instrument



# Wall Drilling for Wiring

## OVERVIEW

Wall Drilling for Wiring is a fundamental course that covers routing cables through basements, crawl spaces, attics, and walls, as well as showcasing techniques for using drills and drilling through different types of exterior and interior walls.

### **Delivery Options:**

 The course is delivered online. Final exam is taken online.

### **Completion Time:**

The estimated completion time for this course is 90 minutes. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

- » any technical personal with the responsibility of bringing wires or cables into a structure

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. safely and accurately drill through walls.
2. drill through walls without damaging property

## COURSE OUTLINE

1. Describe Home Construction Architecture Issues
2. Considering Various Entry Points
3. Drilling Through Walls
4. Recognizing Wall Materials and How to Drill Through the Different Types
5. Wall Entry and Running Wires Through Flooring and Carpet
6. Checking for Obstacles
7. Drilling Angles
8. Routing Wire

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# Consumer Digital Electronics

Part of the **Master Technician** and **Master Installer Certification Series**

## OVERVIEW

The Consumer Digital Electronics course teaches students the what, how, when, where and why of customer premises equipment. The student will learn how to properly lay out a home theater system and correctly adjust video settings on a digital display. An explanation of audio technology, the technology's implementation and interface into the home theater system is provided. The student will learn how to troubleshoot a digital set-top box and which digital video interface to use between customer premises equipment for best picture resolution. The student will also be introduced to the different parental control options for TV programs and video games that may cause the customer to request a technician's assistance. By taking Consumer Digital Electronics the student will have a better understanding of the different components in the home theater system and how they interface and operate together.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 16 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » effectively answer customer questions regarding consumer electronics in the home
- » understand how to connect and operate consumer electronics in the home
- » reduce repeat service calls and improve customer satisfaction
- » have a better understanding of the different audio technologies used in home theater systems
- » recognize the different equipment options associated with installing digital television service
- » use this course to help prepare for SCTE's Broadband Premises Installer certification
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI's Master Installer certification
- » receive credit toward NCTI's Master Technician, Customer Premises certification
- » receive credit toward NCTI's Master Dispatcher certification

### **Ideal for:**

- » new hires
- » residential installers
- » customer service representatives

## COURSE OBJECTIVES

Upon completing this course the student will be able to:

1. identify the key milestones in developing television standards and the major organizations that have defined standards
2. identify the characteristics of standard-, enhanced- and high-definition television and next-generation technologies

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Computers and Broadband Modems
- » Applying Wi-Fi Technologies

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

3. identify the features of digital television technologies and equipment
4. identify the characteristics of past and present video technologies
5. identify the characteristics of projection systems
6. examine the features and characteristics of DVD media
7. examine the features and characteristics of digital storage devices
8. describe the features and characteristics of audio components used in customer's homes
9. explain the technology behind speaker construction
10. explain the difference between analog and digital sound and how the fidelity of the audio signal can be maintained through the analog-to-digital conversion
11. identify the key components and adjustable features of an audio/video receiver
12. describe the proper set-up for home theater components that best fit the needs of the customer
13. examine digital music services and close captioning services
14. identify features, care and maintenance of the digital set-top box
15. discuss best practices for performing set-top box diagnostics
16. explain the digital terminal adapter and Internet protocol TV and how they are used
17. analyze the process and best practices for connecting customer equipment to other video and audio equipment
18. describe the best audio connection options to connect the customers equipment and customize it to their needs
19. examine best practices for installing the customer's television and related components
20. identify the menu features on the TV and how to use the features to assist the customer
21. identify configuration practices for parental control, and the functions of the electronic program guide
22. describe how to operate and troubleshoot remote controls

## COURSE OUTLINE

### 1. Video Standards, Definitions and Services

Encompassing television technology, defining television, regulating and describing digital television services

### 2. Video Display Technologies

Describing tube-type displays, understanding flat panel displays, identifying projection displays and analyzing projectors and screens

### 3. Video Recording and Playback Devices

Examining recording media, explaining digital disc media, exploring hard drive video storage, understanding video game consoles and introducing other digital storage

### 4. Audio Technologies

Examining analog and digital audio technologies for home theater systems, understanding sound reproduction systems, analog-to-digital conversion of audio signals and management of loudness in television audio

### 5. Audio Systems and Services

Exploring audio receiver components, audio/video receiver features, laying out a home theater system and discussing analog and digital music services

### 6. Digital Set-Top Boxes

Examining set-top box and digital terminal adapter physical features, functional features, using set-top box diagnostics and defining IPTV

### 7. Connecting Consumer Electronics

Recognizing the different consumer electronics interfaces, making video connections, audio connections and connecting consumer electronics equipment

### 8. Operating Consumer Electronics

Identifying video device source selections, understanding menu features, exploring video viewing options and analyzing remote controls



# Service Technician

Part of the *Master Technician Certification Series*

## OVERVIEW

The NCTI Service Technician course provides broadband technicians with invaluable information on the broadband cable distribution network, including lessons on amplifiers and passive devices, hardline coaxial cable/connectorization, the fundamentals of cable network powering, basic test equipment operation and signal leakage measurements. This course also teaches all the necessary electronic theory and application techniques needed to conduct technical duties at this level. Fiber-optic cable theory, optical networks and fiber-to-the-home topologies are also covered.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 40 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » earn four hours of college credit
- » use this course to help prepare for SCTE's Broadband Distribution Specialist certification
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician certification

### **Ideal for:**

Broadband technicians and other technical personnel involved in maintaining the distribution system, including:

- » service technicians
- » line technicians
- » plant maintenance technicians
- » installer technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand and apply electronic theory, perform electronic calculations and determine electronic broadband cable network applications
2. explain the theory of operation of passive devices in the distribution network and calculate the input signal level, signal loss and output signal level of passive devices from a design map
3. explain physical characteristics of hardline coaxial cable, calculate the attenuation of the cable for various lengths and temperatures and connectorize the cable
4. splice active and passive devices and activate the broadband cable network
5. explain the theory of operation of standby and non-standby power supplies, perform preventive maintenance and calculate AC input voltages to amplifiers from a design map
6. explain the theory of operation and operate digital signal analyzers and time domain reflectometers

(Continued)

## RECOMMENDED PREREQUISITE

- » Installer Technician

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Digital Technician
- » System Technician
- » Fiber Installation and Activation
- » Fiber Testing and Maintenance

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials enhanced with online videos
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

7. explain the theory of operation and perform setup procedures to rough-balance distribution amplifiers used in HFC distribution networks
8. explain the theory of operation and perform setup procedures to rough-balance line extender amplifiers
9. explain the optical active and passive components of fiber-optic networks and the applications of various fiber-optic topologies

## COURSE OUTLINE

- 1. Distribution System Overview**  
Applying basic electronics to distribution systems, comparing system architectures, examining distribution system transmission equipment, measuring system vital signs and faults and troubleshooting and preventing signal outages and impairments
- 2. Alternating Current**  
Understanding AC power and waveforms
- 3. Understanding AC Waveform Fundamentals**  
Examining AC waveform characteristics and values
- 4. Resistive AC Circuits**  
Understanding basic relationships, eddy currents, skin effect and solving sample problems
- 5. Inductance and Transformers**  
Introducing induction, inductance, inductors and transformers
- 6. Capacitance**  
Explaining capacitance and capacitors
- 7. Examining Hardline Coaxial Cable**  
Learning mechanical and electrical properties of hardline cable
- 8. Connectorizing Hardline Coaxial Cable**  
Selecting proper connectors and adapters, preparing to connectorize coaxial cables, installing connectors and weatherproofing
- 9. Reactances**  
Explaining inductive reactance, capacitive reactance and inductive/capacitive reactances
- 10. Working with Hardline RF Splitters**  
Identifying splitter types and components, examining splitter electrical characteristics, understanding the theory of splitter operation and considering applications
- 11. RF Directional Couplers and Power Inserter**  
Describing directional couplers and power inserters
- 12. Working with RF Taps**  
Identifying types of taps and mechanical components, examining tap electrical characteristics, understanding the theory of tap operation and considering design criteria
- 13. Line Extender Setup and Operations**  
Recognizing the role of the line extender, performing preliminary checks on a line extender, setting up the forward section of a line extender and setting up the return section of a line extender
- 14. Distribution Amplifier Operation**  
Understanding types and applications of distribution amplifiers, examining the distribution amplifier housing, explaining AC and DC powering of distribution amplifiers, working with RF passives and controls in distribution amplifiers, understanding the distribution amplifier module, classifying distribution amplifier specifications, setting up and troubleshooting distribution amplifiers
- 15. Powering Cable Networks**  
Examining ferroresonant power supplies, AC power insertion methods and performing powering calculations
- 16. Semiconductor Materials and P-N Junctions**  
Examining semiconductor material, examining N-type and P-type semiconductors: extrinsic semiconductors
- 17. Diodes and Diode Circuits**  
Examining rectifier circuits and exploring optical diodes
- 18. Using Digital Signal Analyzers**  
Describing digital measurements, operating the digital signal analyzer and using cable modem analyzers
- 19. TDR Fundamentals and Operation**  
Describing types of TDRs, understanding TDR theory of operation and applications, considering TDR preliminaries, noting TDR measurement precautions, learning measurement procedures and pinpointing fault site
- 20. Controlling Signal Leakage**  
Examining signal leakage, describing measurement equipment and preventing and repairing signal leakage
- 21. Understanding Fiber Optics and HFC Networks**  
Introducing fiber optics, constructing fiber networks, the evolving HFC network and optimizing the HFC network
- 22. Developing Prevention Programs**  
Ensuring safety awareness, monitoring leakage, stressing preventive maintenance and reducing outages and theft



# Return Path Operations

Part of the *Master Technician Certification Series*

## OVERVIEW

This course introduces the basic concepts of return path functions, and outlines procedures for testing, repairing and maintaining a viable return path for the support of revenue sources and services such as video-on-demand (VOD), high-speed data (HSD) and telephony. The student will learn what can jeopardize the return path performance including ingress, laser operations, noise, system alignment and installation of equipment at the customer premises. The course also describes how the operation of the return path has transformed to becoming integral to the successful and reliable operation of cable modems, VOD, telephony and many other services via the broadband HFC network.

### **Delivery Options:**

 The course is delivered online with learning activities throughout each lesson.

A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

Varies based on the student's self-study pace, however, the maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » gain the knowledge to troubleshoot the return path
- » maximize revenue by maintaining optimal performance levels of premises equipment
- » improve customer satisfaction levels with new and legacy premises equipment
- » help speed the roll out of new services that utilize the return path
- » receive credit towards NCTI® Master Technician certification
- » receive an industry recognized NCTI certificate of graduation
- » use this course to help prepare for SCTE's Broadband Distribution Specialist (BDS) and Broadband Transportation Specialist (BTS) certifications

### **Ideal for:**

Personnel who install services, perform demand or preventive maintenance on the coaxial plant or work on the fiber-optic portion of modern HFC networks. This includes:

- » service technicians
- » system technicians
- » high-speed data technicians
- » installers
- » network technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe the return path signal flow and major transmission elements
2. explain the concept of long-loop automatic gain control and how it is used to establish RF levels from cable modems, embedded multimedia terminal adapters (EMTA), and set-top boxes (STB)

(Continued)

## RECOMMENDED PREREQUISITES

- » Installer/Technician
- » Fiber Installation and Activation

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Broadband Digital Installer
- » Service Technician
- » System Technician
- » Fiber Testing and Maintenance

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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## COURSE OBJECTIVES *(Continued)*

3. explain the concept of funneling on the return path
4. discuss procedures for improving overall return path performance, including use of high-pass filters and step attenuators
5. explain how test equipment for return path alignment measures return path signal levels
6. discuss the differences, advantages and disadvantages of single carrier, multicarrier and return sweep testing
7. define and discuss upstream transmit level and path attenuation
8. explain how to measure the amplitude of transient signals and noise measurements on the return path
9. describe why optimization of the optical portion of the return path is critical to reliable operations of the services that use the return path
10. identify methods for multiplexing multiple return paths into a single fiber, including frequency stacking, wavelength division multiplexing, dense wavelength division multiplexing and digital return

## COURSE OUTLINE

### 1. Return Path Operations Overview

Understanding return path signal flow in the hybrid fiber/coaxial (HFC) network, examining technical challenges and maintaining the return path

### 2. Introducing Return Path Fundamentals

Learning return path frequency spectrums, explaining how the reverse path works, calculating return path loss in the drop system, assessing the quality of the drop's return path examining house amplifiers and installing mitigation filters at the customer premises

### 3. Troubleshooting the Return Path

Describing return path test equipment, troubleshooting the return path in the drop system and using the spectrum analyzer to troubleshoot the return path in the HFC network.

### 4. Maintaining Return Path Signals

Describing return path amplifier levels, setting return amplifier levels and balancing the return path

### 5. Examining Signals in the Return Path

Modulating return path signals, examining spectrum sharing technologies, analyzing return path carriers and DOCSIS 3.0 in the return path

### 6. Examining the Optical Return Path

Examining optical return technologies, optimizing optical return path performance and introducing optical return path multiplexing



# Digital Technician

Part of the *Master Technician Certification Series*

## OVERVIEW

Digital technology is all around us, from the clocks on our coffee makers to our mobile phones and computers. Broadband cable technicians are trained to install and service digital customer premises equipment (CPE) such as set-top boxes (STB) and cable modems that connect to digital televisions and computer devices. The NCTI Digital Technician course elevates the broadband cable technician's knowledge of digital technology beyond CPE. To put the significance of digital communications into context, the course begins with a review of several applications of digital technology in communications. Binary and hexadecimal numbering systems including Boolean algebra, which are digital fundamentals, are explained as well as how analog signals are converted to digital signals. Techniques to identify, omit and recover redundant data in a digital signal are described before presenting details of various digital modulation schemes and methods for overcoming bandwidth limitations. The compression and transport standards from the Moving Picture Experts Group (MPEG) are reviewed, followed by explanations of the Internet protocol (IP) and IPTV. After completing the Digital Technician course, technicians can apply what they have learned to troubleshoot and resolve problems as well as prepare for career advancement.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is 18 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician certification

### **Ideal for:**

- » service technicians
- » system technicians
- » headend technicians
- » managers and supervisors looking to keep skills current
- » network operations

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain both the present and future of digital technology
2. recognize how digital technology is applied in applications pertaining to state-of-the-art techniques in broadband cable network operations and inside the customer premises
3. identify services that are enabled by digital communications
4. describe the fundamentals of digital communications

(Continued)

## RECOMMENDED PREREQUISITES

- » Installer
- » Installer Technician
- » Broadband Digital Installer
- » Service Technician

## RELATED COURSES

*Students completing this course should then enroll in:*

- » System Technician
- » Troubleshooting Advanced Services

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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5. describe how digital information is modulated onto a carrier for transport and distribution over a network
6. describe how measurements of digital modulation channel power differ from analog amplitude measurements, why it is of concern and how these power measurements are executed
7. interpret measured digital modulation channel parameters to determine if and what, corrective action needs to be taken
8. describe how digital modulation technology is used to maximize the use of RF spectrum and channel bandwidth
9. identify the Moving Pictures Expert Group (MPEG) and the role it has in the development of digital television
10. describe the Internet protocol suite and how it works
11. explain how digital TV has enabled the delivery of TV content to devices other than stationary television sets

## COURSE OUTLINE

### 1. Applying Digital Communications Technology

Identifying interactive network models, examining telephone services and discussing trends in television

### 2. Fundamentals of Digital Communications

Reviewing digital communications, examining character codes and data compression and presenting logic gates

### 3. Digital Modulation

Diagnosing the continuous wave carrier, delving into pulse code modulation, describing digital modulation schemes, highlighting digital vestigial sideband modulation and modulating OFDM subcarriers

### 4. Digital Channel Amplitude Measurements

Defining digital modulation measurement values, adjusting amplitude levels for channel bandwidth, loading the downstream frequency spectrum and assessing return channel levels

### 5. Quantifying Digital Channel Quality

Defining digital measurements, considering digital modulation test instruments and interpreting digital modulation measurements

### 6. Network Capacity Management

Improving spectrum efficiency, compressing TV signals and controlling source content

### 7. MPEG Standards and Data Streams

Identifying the Moving Pictures Expert Group, describing the MPEG-2 Systems Layer and assessing digital TV quality

### 8. The Internet Protocol Suite

Moving data over the Internet, discussing the Transport Layer of the Internet protocol suite and integrating television into the Internet protocol suite

### 9. Concepts of IPTV

Disrupting legacy television service delivery, distributing IPTV content and addressing Internet protocol TV distribution challenges



# Fiber Installation and Activation

Part of the *Master Technician Certification Series*

## OVERVIEW

The NCTI Fiber Installation and Activation course provides indispensable and up-to-date information on the deployment of fiber-optic cable in broadband networks. The course outlines the basics of optical transmission, modulation and transport through optical fiber along with the reception and conversion of the optical signal back to electrical signals. The characteristics of different types of optical fiber and cable construction are introduced and described with explanations for their application. Fiber-optic network architecture, topology, design and construction practices are also covered. Fiber Installation and Activation instructs how to install and activate fiber-optic networks and also prepares the student to splice optical fibers using mechanical and fusion methods. Passive optical network (PON) access technologies utilizing fiber-to-the-premises (FTTP) topologies, which include GPON, EPON, RFoG and next generation access (NGA) architectures, are described and compared. The course assumes previous knowledge and experience in RF Broadband Technology.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 32 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » earn two hours of college credit
- » receive credit toward NCTI® Master Technician certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Technical personnel, including:

- » fiber-optics technicians
- » service technicians
- » network technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify the optical spectrum and wavelengths of light waves used for fiber-optic communications
2. describe the optical sources and receivers used for fiber-optic communications
3. describe safety materials and procedures for handling and splicing optical fibers
4. recognize common standards used in fiber-optic transport networks
5. describe the different optical fiber types and factors that determine how well light waves are transported through optical fiber
6. identify different types of fiber-optic cable and their applications

(Continued)

## RECOMMENDED PREREQUISITE

- » Service Technician

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Fiber Testing and Maintenance
- » System Technician
- » Fiber Optics Workshop

## TRAINING FEATURES

- » Knowledge-based, broadband-and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

7. describe optical connectors, patch panels and ancillary optical devices such as optical splitters, pigtails and attenuators
8. explain the procedures to prepare a splice closure and a fiber-optic splice tray
9. describe how to splice fiber-optic cable
10. discuss considerations and specifications for proper installation of fiber-optic cable
11. describe the different types of optical modulation and optical detection technologies
12. discuss the differences in coarse wavelength division multiplexing, wide wavelength division multiplexing and dense wavelength division multiplexing technologies
13. describe the synchronous optical network (SONET)
14. identify the different optical network architectures and topologies, including fiber-to-the-premises (FTTP)
15. list the steps in the setup of an optical transmitter and receiver
16. define and give examples of an optical power budget
17. discuss the application and operation of centralized and distributed node powering
18. recognize the different passive optical network (PON) access architectures

## COURSE OUTLINE

### 1. Discovering Fiber-Optic Technology

Exploring fiber-optic fundamentals, understanding light sources and examining optical detectors

### 2. Introducing Fiber-Optic Networks

Exploring the basic HFC architecture, examining scalable optical nodes, identifying applications and services, citing transmission standards and handling fiber-optic cable safely

### 3. Investigating Properties of Fiber-Optic Cable

Identifying optical fiber types, evaluating fiber performance and examining optical fiber dimension tolerances

### 4. Investigating Fiber-Optic Components and Terminations

Examining fiber-optic cable, optical connectors, cable management panels, optical splitters and ancillary devices

### 5. Preparing Optical Fibers for Splicing

Preparing to join optical splitters and working with splice closures

### 6. Splicing and Terminating Fiber-Optic Cable

Examining various splicing techniques and installing facility terminations

### 7. Introducing Fiber-Optic Cable Construction Techniques

Discussing the importance of safety and examining fiber-optic cable installation in outside plant

### 8. Installing Fiber-Optic Cable in Outside Plant

Installing aerial fiber-optic cable and installing fiber-optic cable in conduit

### 9. Understanding Optical Transmission Systems

Examining optical modulation techniques, discussing optical detection and demodulation, examining the synchronous optical network (SONET) and examining wavelength division multiplexing

### 10. Fiber-Optic Network Architectures and Topologies

Examining fiber-optic network architecture, introducing FTTx network topologies and describing passive optical network topologies

### 11. Transmitting and Receiving Optical Signals

Studying optical transmitters, understanding optical receivers and recognizing optical transport elements

### 12. Understanding Fiber-Optic Network Design

Establishing network design guidelines, analyzing the network design route and discussing network documentation

### 13. Fiber-Optic Node Powering

Powering optical networks, examining outside plant power distribution and node equipment

### 14. Passive Optical Networks

Presenting passive optical networks (PON), examining PON architectures in broadband cable networks and introducing next-generation access (NGA) architectures



# System Technician

Part of the *Master Technician Certification Series*

## OVERVIEW

The NCTI System Technician course provides foundational information that can help accelerate a broadband cable technician's career path advancement. One of the courses included in NCTI's Master Technician certification, the System Technician course, is intended to elevate the student's understanding of how hybrid fiber/coax (HFC) network equipment operates down to the component level. The student will study principles of amplitude, frequency and phase modulation, which remain integral in modern digital modulation schemes. The course covers the basic circuits that are within most equipment being serviced in today's broadband cable networks, power supply and amplifiers. Amplifier operations in broadband cable network applications is first described before a detailed explanation of how to align HFC distribution amplifiers is presented. Proactive Network Maintenance (PNM), a feature of DOCSIS 3.1, is explained along with the basics of spectrum analyzers and network sweeping. The course also includes a description of the equipment and techniques used for underground construction. The value of this foundational information becomes apparent when the broadband cable technician successfully troubleshoots and resolves escalated problems.

### Delivery Options:

 The course is delivered online with in-course activities to promote learning. Lesson and final exams are also taken online.

### Completion Time:

The estimated completion time for this course is 26 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students:

- » earn four hours of college credit
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Master Technician certification

### Ideal for:

Broadband cable service technicians seeking advancement through their company's career path.

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. list the dimensional elements of a carrier wave and how they can be modified with information during the modulation process
2. identify the functional blocks of a receiver and explain their operation
3. describe the operation and applications for bipolar junction and field effect transistors in basic circuit configurations
4. describe operational amplifiers and some of the more common circuit applications where they are used
5. describe several discrete amplifier circuits and applications used in broadband cable equipment
6. explain and identify what parameters are to be considered and can be adjusted for optimal operation of an RF amplifier in a broadband cable network

(Continued)

## RECOMMENDED PREREQUISITES

*Students taking this course should have experience working in hybrid fiber/coax (HFC) networks from the node to the distribution taps. It is suggested that the following courses are completed prior to taking this System Technician course:*

- » Installer
- » Installer Technician
- » Service Technician
- » Return Path Operations

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Digital Technician
- » Fiber Installation and Activation
- » Advanced Technician
- » Effective Supervision

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

7. explain the operation of several types of oscillators, including crystal oscillators and multivibrators
8. describe distribution amplifiers, their application and alignment
9. explain how DOCSIS modems can enable proactive network maintenance for more reliable network operations
10. describe how to use a spectrum analyzer for various measurements in a hybrid fiber/coax network
11. explain what is meant by sweeping a broadband cable network, the test equipment and how the forward and return paths are swept
12. describe how underground broadband cable networks are built using trenching and directional boring methods

## COURSE OUTLINE

### 1. Discussing Modulation

Examining the unmodulated carrier, discussing amplitude modulation, diagnosing frequency modulation and identifying digital modulation variations

### 2. Exploring Communications Circuit Blocks

Identifying the functional blocks of a receiver, delving into tuned circuits, employing intermediate frequencies and recognizing amplifier properties

### 3. Discussing Discrete Amplifier Components

Exploring bipolar junction transistors and discovering field effect transistors

### 4. Detailing Operational Amplifier Circuits

Diagnosing operational amplifier structure, examining the most basic operational amplifier circuit and discussing representative operational amplifier circuits

### 5. Diagnosing Discrete Amplifier Circuits

Defining key amplifier properties, analyzing the Class A amplifier and utilizing push-pull amplifiers

### 6. Operating RF Amplifiers in Broadband Cable Networks

Assessing RF amplifier applications, balancing between noise and distortion and interpreting RF amplifier specifications

### 7. Delving into Oscillators

Identifying relevant oscillator applications, explaining how oscillator circuits work, diagnosing crystal oscillators and presenting the multivibrator family

### 8. Aligning Distribution Amplifiers

Introducing the distribution amplifier, examining the distribution amplifier and aligning the distribution amplifier

### 9. Leveraging DOCSIS Modems for Proactive Network Maintenance

Presenting DOCSIS Proactive Network Maintenance, executing Proactive Network Maintenance and addressing linear distortion

### 10. Recognizing Spectrum Analyzer Basics

Presenting the spectrum analyzer, recognizing spectrum analyzer operation and operating the spectrum analyzer

### 11. Sweeping Broadband Cable Networks

Describing network sweep, operating a sweep system and sweeping the downstream and upstream

### 12. Constructing Underground Plant: Trenching

Using chain trenchers, digging trenches, burying coaxial cable and backfilling the trench

### 13. Constructing Underground Plant: Plowing and Boring

Understanding plowing, discussing dry boring machines and explaining fluid-assisted boring



# Introduction to Multiplexing

## OVERVIEW

Multiplexing signals together onto a common medium for transport is a practice that is an often-overlooked stage of signal processing. The NCTI® Introduction to Multiplexing course defines time division multiplexing (TDM) and frequency division multiplexing (FDM), the two most common multiplexing schemes that have long been used to transport television and telephone signals through their respective transport mediums. An overview of orthogonal frequency division multiplexing (OFDM) is provided as it has now become commonplace in many applications. Optical multiplexing, which falls under the banner of wave division multiplexing (WDM), requires review of fiber-optic technologies before various levels of WDM can be defined. Detailed explanations are provided of how TDM is used in assorted telecommunications protocols that were first used by the telephone industry before being implemented in many broadband cable networks. This course is beneficial for the technician who works in the hybrid fiber coax (HFC) network or headend.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify the characteristics of the most common multiplexing techniques
2. compare the types of wavelength division multiplexing and how they work
3. describe how time division multiplexing is adapted for different applications

## COURSE OUTLINE

### **1. Distinguishing Multiplexing Schemes**

Discussing optical fiber basics, describing frequency division multiplexing and assessing orthogonal frequency division multiplexing

### **2. Multiplexing Optical Wavelengths**

Introduction to understanding wave propagation, defining the electromagnetic spectrum and wavelength, assessing optical fiber modes, defining wavelength division multiplexing, applying wide wavelength division multiplexing, examining coarse wavelength division multiplexing and discussing dense wavelength division multiplexing

### **3. Detailing Time Division Multiplexing**

Interleaving data, defining time division multiplexing frames, optimizing TDM efficiency, identifying synchronous TDM applications and recognizing asynchronous TDM applications

## RECOMMENDED PREREQUISITES

- » Service Technician
- » System Technician

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# Introduction to Wide Area Networks

Part of the **Telecom Specialist Certification Series**

## OVERVIEW

Wide area networks (WAN) comprise the data networks covering individual cities, to the entire globe. The data on these networks, naturally, includes video and voice. For technicians to perform well in this world, they need to be familiar with the various WAN technologies. As an introduction into WAN, this course teaches satellite network basics, as well as how the various WAN technologies work together to transport data; such as synchronous optical networks (SONET), Ethernet and multiprotocol label switching (MPLS). Virtual private networks (VPN) functionality and security is also explored.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is four hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Telecom Specialist certification

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify the advantages and disadvantages of the different WAN technologies
2. differentiate between the types of packet switched technologies
3. discuss synchronous optical network (SONET) and how it is used as a transport protocol
4. describe the characteristics of Ethernet protocol
5. explain how multiprotocol label switching (MPLS) relates to time-division multiplexing (TDM), asynchronous transfer mode(ATM) and Ethernet
6. describe how virtual private networks (VPN) function and how the various VPN security methods work

## COURSE OUTLINE

### **1. Wide Area Networks Technologies**

Exploring wide area networks, reviewing communication satellite networks, examining synchronous optical networks (SONET) and examining ethernet

### **2. Multiprotocol Label Switching**

Exploring multiprotocol label switching (MPLS) and examining virtual private networks (VPN)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Introduction to Protocols and Network Routing
- » Introduction to Networking: Home & Peer-to-Peer Networks

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# Introduction to Protocols and Network Routing

## OVERVIEW

Networking is an integral part of the broadband industry and any industry that provides communication technology services. The key to being a contributor to your industry and company is to learn as much as you can about IP networks. Although this is not an overnight process, this course teaches the introductory fundamentals of IP networking. Learning about networking starts with the OSI (Open Systems Interconnection) reference model. From there, you will learn the structure of IP addresses and packets in IPv4 and IPv6. Fully qualified domain names (FQDN) are explored along with subnet masking and multicasting. Finally, transport layer protocols such as TCP (transmission control protocol) and UDP (user datagram protocol) are explained.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is four hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe the OSI reference model, IP structure and how they relate to network routing.
2. examine the attributes of a DNS and how it is used to share information around the world
3. describe the characteristics of subnet masking classless routing protocols used to forward subnet masks along with their updates through the network
4. examine the components of IP Multicasting and how it enables data communications.
5. discuss the features of gateway protocols and how they instruct and distribute communications
6. examine the Transport Layer protocol messages in the OSI reference model

## COURSE OUTLINE

### **1. Network Routing Principles**

Examining Internet protocol addresses, examining domain name system (DNS) and examining subnet masking

### **2. Network Protocols**

Examining Internet protocol multicasting, exploring gateway protocols and explaining transport layer protocols

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Understanding Voice and Data Networks

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# Fiber Testing and Maintenance

Part of the *Master Technician Certification Series*  
and *Telecom Specialist Certification Series*

## OVERVIEW

The NCTI Fiber Testing and Maintenance course provides the fiber-optic cable technician with information regarding post activation fiber-optic theory and application. The course concentrates on the test equipment and procedures necessary to perform testing and maintenance for new fiber-optic cable links, troubleshooting service outages and restoring fiber-optic links to their original performance specifications. The course also describes the process of fiber-optic cable restoration planning and implementation of preventive maintenance regimens in an HFC network.

### **Delivery Options:**

 The course is delivered online and comes enhanced with 30 instructional videos developed in partnership with Light Brigade.® A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

Varies based on the student's self-study pace, however, the maximum time allowed is six months from enrollment.

## BENEFITS

Upon completion students will:

- » understand the importance of recording and maintaining fiber-optic cable link performance documentation
- » have the knowledge to operate and use fiber-optic cable test equipment
- » be able to correctly set up and use the OTDR for initial testing, turn-up and restoration purposes
- » have the ability to read and understand fiber-optic cable event signatures
- » be familiar with basic restoration procedures
- » earn two hours of college credit
- » use this course to help prepare for SCTE's Broadband Transportation Specialist certification
- » receive credit toward NCTI Master Technician certification
- » receive credit toward NCTI Telecom Specialist certification
- » earn an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Technical personnel involved in maintaining the fiber-optic portion of HFC networks, including:

- » fiber-optic cable technicians
- » service technicians
- » network technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. know what to look for when making visual inspections of the outside fiber-optic cable plant
2. explain what damage can be done to the fiber-optic cable during the installation process that does not immediately appear

(Continued)

## RECOMMENDED PREREQUISITES

- » Service Technician
- » Fiber Installation and Activation

## RELATED COURSES

*Students completing this course should then enroll in:*

- » System Technician
- » Advanced Technician
- » Fiber Optics Workshop

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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Powers Frontline Performance



## COURSE OBJECTIVES *(Continued)*

3. explain how to check post-installation damage to ensure that all damaged and stressed fiber-optic cable is identified and replaced
4. perform tests using the optical power meter for measuring optical transmit and receive power
5. explain the function of a light source and why maintaining optical stability is important
6. explain how a laser light source is used to identify an optical fiber
7. identify the components of an OTDR waveform display
8. identify the advantages of optical fiber break locators
9. distinguish between long and short pulse widths
10. realize the importance of entering the correct index of refraction into an OTDR
11. connect an optical fiber to an OTDR using compatible and incompatible connectors and polishes
12. understand the difference between a reflectance measurement and an optical return loss (ORL) measurement
13. accurately measure optical splice and connector loss
14. perform a step by step acceptance test of a fiber-optic cable reel
15. identify multiple optical fiber strands after a splitter on an OTDR trace
16. recognize the difference between a real event and a ghost event on an OTDR trace
17. describe how to measure transmitter optical power and receiver optical power levels using an optical power meter
18. understand the relationship between the DC voltage test point and optical power
19. identify procedures for set up of the return path from the node to the headend
20. explain how to use network documentation
21. explain the purpose of the fiber-optic test sets used to troubleshoot a system problem
22. list the test parameters that must be entered into the OTDR prior to making any test
23. explain what causes reflective and non-reflective events
24. identify the typical sources of failure in the equipment room and in the outside plant
25. describe how service may be restored in a temporary and a permanent restoration
26. describe the differences between aerial and underground restorations
27. describe safety practices specific to the restoration environment
28. explain how dense wavelength division multiplexing (DWDM) and coarse wavelength division multiplexing (CWDM) can change preventive maintenance requirements
29. identify applications of various types of optical spectrum analyzers

## COURSE OUTLINE

### 1. Maintaining Optical Networks

Knowing the fiber-optic cable network, preparing for what can go wrong in the fiber-optic cable network, understanding the fiber-optic cable troubleshooting process and documenting fiber-optic cable additions, moves and changes

### 2. Introducing Optical Test Equipment

Examining optical power meters, laser light sources, optical fiber identifiers, optical talk sets and optical loss test sets

### 3. Presenting Optical Time Domain Reflectometer (OTDR) Basics

Introducing OTDRs, describing OTDR types and examining OTDR features

### 4. Preparing for OTDR Measurements

Performing preliminary OTDR procedures, programming the OTDR and understanding OTDR tests

### 5. Performing OTDR Measurements

Recognizing OTDR signatures, conducting OTDR tests and making span measurements with an OTDR

### 6. Conducting Acceptance Testing of a Broadband Optical Link

Testing optical power and reflectivity, testing optical transmitters and receivers and using optical fiber documentation

### 7. Troubleshooting the Fiber Outage

Understanding key elements of effective fiber-optic troubleshooting and outlining the fiber-optic troubleshooting process

### 8. Planning Fiber-Optic Restorations

Explaining a fiber restoration plan, understanding causes of optical failures and planning efficiently and effectively for fiber restorations

### 9. Restoring Service in Optical Networks

Assembling necessary resources for fiber restorations, outlining fiber restoration safety concerns, adjusting to the fiber restoration scenario and preparing for the next fiber restoration

### 10. Preventing Optical Failures

Inspecting the fiber-optic cable plant visually, using status monitoring tools, testing optical transport and identifying RF effects on optical performance



# Fiber Optics Workshop

## OVERVIEW

This two-day class contains 16 hours of hands-on labs to provide practical understanding and skills required to properly design, install and maintain fiber optic networks. Applicable for fiber optic communication systems in Telco, Broadband and Premises (LAN) applications. Students will use the latest fiber optic technology and equipment to learn how to splice, connectorize, test and troubleshoot optical fiber networks in order to increase efficiency, reliability and on-the-job safety as well as reduce cost and downtime.

Students will break into groups led by one instructor per group – this low ratio ensures each student receives the one-on-one training necessary to fully understand and learn how to perform fiber-optic installation, testing and troubleshooting in the field. Students spend approximately 3-4 hours at workstations, rotating through until all tasks are completed.

## CERTIFICATIONS AND CREDITS

- » Electronics Technicians Association (ETA) Fiber Optic Installer (FOI) [\$150]
- » 28 BICSI ITS Continuing Education Credits
- » 4 SCTE Recertification Units
- » Light Brigade Certificate of Completion

## SKILLS LAB OUTLINE

### WORKSTATION #1 – CABLE & SPLICE CLOSURE PREPARATION

Learn how to safely and properly prepare fiber-optic cable for acceptance testing, splicing, termination and mid-entries on communication systems. An outline of hands-on training covered at this workstation includes:

- » prepare distribution, breakout and loose-tube cables
- » learn how to perform a fanout on outdoor cable structures
- » learn why fiber and cable lengths do not match with an OTDR and learn how to compensate for these effects
- » learn how to properly document an acceptance test on reels of cable
- » learn how to prepare a fiber optic closure
- » learn how to ground a cable splice into a closure
- » learn how to dress a mid-entry into a closure
- » learn how to transfer fibers from storage trays to splice trays
- » learn how to organize and dress splice trays
- » learn how to “block” loose-tube cable gels
- » learn how to organize jumpers and pigtailed in the panel/closure
- » learn about labeling issues in panels and closures
- » learn about possible points of failure and their prevention

## RECOMMENDED PREREQUISITE

- » Graduates of NCTI's *Fiber Installation and Activation* and *Fiber Testing and Maintenance* courses are eligible for this class.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available

(Continued)





## **WORKSTATION #2 – FUSION & MECHANICAL SPLICING**

This workstation includes background material on optical fibers, cables, cleaving tools, techniques and disciplines associated with optical splicing. The focus of the module is the fusion and mechanical splicing of optical fibers in temporary, permanent and emergency restoration applications.

A fiber network depends on splice quality and workmanship. This workstation provides both the skill and knowledge components to perform correct splicing operations for various applications.

Students will learn how to:

- » correctly strip 250 and 900 micron optical fibers using two separate techniques
- » correctly cleave optical fibers using cleaving tools (three types)
- » properly place splice protectors over fusion splices (two types)
- » correctly fusion splice fibers
- » adjust the fusion splice to compensate for environmental issues
- » pigtail splice from 250 to 900 micron fibers
- » identify the different OTDR signatures for fusion and mechanical splices
- » document splice losses
- » perform mechanical splices for quick restoration
- » troubleshoot procedures for splicing

## **WORKSTATION #3 – OTDR THEORY & OPERATION**

This workstation instructs and educates students on OTDR operation and its use in fiber-optic communication systems.

The module content includes background material on theory, operation, and applications of the OTDR. The theory will explain OTDR operation, terminology and functions. Applications will include optical cable acceptance testing, monitoring splices, and installed optical cables and how the OTDR is used during maintenance and restoration of optical cables. These topics are applied to the hands-on portion of the module during the OTDR operation training.

The OTDR is an important tool for fiber-optic testing and troubleshooting.

Students will learn how to:

- » operate an OTDR
- » setup and calibrate an OTDR
- » perform the OTDR basic functions:
  - acceptance testing (reel)
  - splice & span loss testing
  - use of the OTDR for outage restoration
  - reading various OTDR signatures for troubleshooting
- » documentation

## **WORKSTATION #4 – CONNECTORIZATION**

This workstation instructs and educates students on proper connectorization of optical fibers for communication systems. Background material is provided on optical fibers, cables, connector styles, bonding techniques, cleaving tools and related test and inspection equipment.

The focus of the workstation is to enhance the abilities of the technician to connectorize distribution, breakout and loose-tube cables in addition to standard cordage. The workstation will focus on techniques that improve optical performance while increasing yield.

*(Continued)*



## **WORKSTATION #4 – CONNECTORIZATION** *(Continued)*

Students learn how to terminate optical fibers using several bonding methods, such as epoxy oven cure and quick cure using anaerobic adhesive. Students will:

- » terminate ST and SC connectors
- » visually inspect fiber endfaces and learn the quality control criteria
- » test built assemblies for optical loss
- » troubleshoot terminations for loss and failures – discerning which connector end has failed

## **WORKSTATION #5 – OPTICAL LOSS TESTING**

This workstation instructs and educates students on optical loss testing for fiber-optic communication systems. Background material is included on light sources, power meters and optical loss test sets used in testing fiber-optic transmission equipment and end-to-end cable spans.

Work and skill sheets assist the operator in documenting fiber equipment and spans. This information is critical for demonstrating and instructing students in the applications and operations of optical loss test equipment.

OLT – Optical Loss Testing is required for testing fiber-optic systems to establish loss over the span.

The following is covered:

- » measuring your equipment's transmit power
- » measuring your equipment's receive power
- » how to perform end-to-end and link loss measurements
- » documentation
- » troubleshooting using:
  - test sets
  - visual fault finders
  - identifier



*Produced in Conjunction with*

**LIGHT BRIGADE**



# Fiber Optics 1-2-3

## OVERVIEW

This four-day class has been developed with 16 hours of classroom lecture and 16 hours of hands-on skills labs to provide practical understanding and skills required to properly design, install and maintain fiber optic networks in Telco, Broadband and Premises (LAN) applications. This course is also available in a two-day version with 16 hours of classroom lecture.

Students will use the latest fiber optic technology and equipment to learn how to connectorize, splice, test and troubleshoot optical fiber networks in order to increase efficiency, reliability and on-the-job safety as well as reduce cost and downtime.

The course is intended for those who design, install, test and maintain fiber optic communication systems for voice, video and data applications.

## CERTIFICATIONS AND CREDITS

- » Electronics Technicians Association (ETA) Fiber Optic Installer (FOI) [\$150]
- » 28 BICSI ITS Continuing Education Credits
- » 4 SCTE Recertification Units
- » Light Brigade Certificate of Completion

## CLASSROOM COURSE OUTLINE

- 1. Introduction to Fiber Optics**  
Standards and terminology
- 2. Fiber Theory and Optical Fibers**  
Single-mode, multimode and new generation
- 3. Fiber Optic Cables**  
Indoor/outdoor and special types
- 4. Connectors**  
Single-mode, multimode, SFF styles, attenuators and terminators, reflection and polishes, connector cleaning and inspection
- 5. Fiber Optic Splicing**  
Fusion splicing, mechanical splicing and cleaving tools
- 6. Cable Management**  
Panels, closures, pedestals and FTTx products
- 7. Installation**  
Outside plant, underground, aerial and premises / LAN
- 8. Test Equipment and Testing**  
Optical loss test sets, optical time-domain reflectometers (OTDRs), visual inspection equipment, dispersion testers
- 9. Optical Testing**  
Premises, outside plant and systems
- 10. Restoration/Maintenance**  
Outside plant, premises and emergency restoration
- 11. Safety**
- 12. System Design**  
Sources / detectors, repeaters / amplifiers, passive devices, WDM, DWDM, CWDM, loss budgets and integration
- 13. Systems Overview**  
Ethernet, HDTV, SONET and FTTx/PON

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available

(Continued)





## SKILLS LAB OUTLINE

### WORKSTATION #1 – CABLE & SPLICE CLOSURE PREPARATION

Learn how to safely and properly prepare fiber-optic cable for acceptance testing, splicing, termination and mid-entries on communication systems. An outline of hands-on training covered at this workstation includes:

- » prepare distribution, breakout and loose-tube cables
- » learn how to perform a fanout on outdoor cable structures
- » learn why fiber and cable lengths do not match with an OTDR and learn how to compensate for these effects
- » learn how to properly document an acceptance test on reels of cable
- » learn how to prepare a fiber optic closure
- » learn how to ground a cable splice into a closure
- » learn how to dress a mid-entry into a closure
- » learn how to transfer fibers from storage trays to splice trays
- » learn how to organize and dress splice trays
- » learn how to “block” loose-tube cable gels
- » learn how to organize jumpers and pigtails in the panel/closure
- » learn about labeling issues in panels and closures
- » learn about possible points of failure and their prevention

### WORKSTATION #2 – FUSION & MECHANICAL SPLICING

This workstation includes background material on optical fibers, cables, cleaving tools, techniques and disciplines associated with optical splicing. The focus of the module is the fusion and mechanical splicing of optical fibers in temporary, permanent and emergency restoration applications.

A fiber network depends on splice quality and workmanship. This workstation provides both the skill and knowledge components to perform correct splicing operations for various applications.

Students will learn how to:

- » correctly strip 250 and 900 micron optical fibers using two separate techniques
- » correctly cleave optical fibers using cleaving tools (three types)
- » properly place splice protectors over fusion splices (two types)
- » correctly fusion splice fibers
- » adjust the fusion splice to compensate for environmental issues
- » pigtail splice from 250 to 900 micron fibers
- » identify the different OTDR signatures for fusion and mechanical splices
- » document splice losses
- » perform mechanical splices for quick restoration
- » troubleshoot procedures for splicing

### WORKSTATION #3 – OTDR THEORY & OPERATION

This workstation instructs and educates students on OTDR operation and its use in fiber-optic communication systems.

The module content includes background material on theory, operation, and applications of the OTDR. The theory will explain OTDR operation, terminology, and functions. Applications will include optical cable acceptance testing, monitoring splices and installed optical cables, and how the OTDR is used during maintenance and restoration of optical cables. These topics are applied to the hands-on portion of the module during the OTDR operation training.

The OTDR is an important tool for fiber-optic testing and troubleshooting.



### **WORKSTATION #3 – OTDR THEORY & OPERATION** *(Continued)*

Students will learn how to:

- » operate an OTDR
- » setup and calibrate an OTDR
- » perform the OTDR basic functions:
  - acceptance testing (reel)
  - splice & span loss testing
  - use of the OTDR for outage restoration
  - reading various OTDR signatures for troubleshooting
- » documentation

### **WORKSTATION #4 – CONNECTORIZATION**

This workstation instructs and educates students on proper connectorization of optical fibers for communication systems. Background material is provided on optical fibers, cables, connector styles, bonding techniques, cleaving tools and related test and inspection equipment.

The focus of the workstation is to enhance the abilities of the technician to connectorize distribution, breakout, and loose-tube cables in addition to standard cordage. The workstation will focus on techniques that improve optical performance while increasing yield.

Students learn how to terminate optical fibers using several bonding methods, such as epoxy oven cure and quick cure using anaerobic adhesive. Students will:

- » terminate ST and SC connectors
- » visually inspect fiber endfaces and learn the quality control criteria
- » test built assemblies for optical loss
- » troubleshoot terminations for loss and failures – discerning which connector end has failed

### **WORKSTATION #5 – OPTICAL LOSS TESTING**

This workstation instructs and educates students on optical loss testing for fiber-optic communication systems. Background material is included on light sources, power meters and optical loss test sets used in testing fiber-optic transmission equipment and end-to-end cable spans.

Work and skill sheets assist the operator in documenting fiber equipment and spans. This information is critical for demonstrating and instructing students in the applications and operations of optical loss test equipment.

OLT – Optical Loss Testing is required for testing fiber-optic systems to establish loss over the span.

The following is covered:

- » measuring your equipment's transmit power
- » measuring your equipment's receive power
- » how to perform end-to-end and link loss measurements
- » documentation
- » troubleshooting using:
  - test sets
  - visual fault finders
  - identifier



*Produced in Conjunction with*

**LIGHT BRIGADE**



# Advanced Outside Plant Technician

## OVERVIEW

This four-day instructor-led course features one day of classroom theory that delivers a quick refresher on fiber terminology and technology before diving into FTTx, emergency restoration, fiber characterization and how the latest industry trends may impact field practices. This is followed by three days of hands-on skills training, where attendees build and troubleshoot a passive optical network from patch panel to patch panel through various splice closures with multiple drops.

Please contact NCTI Customer Care at 866.575.7206 for dates and locations. Courses must be purchased at least two weeks in advance to avoid late fees. Discounts may be available for this course, please contact NCTI Customer Care to learn more and/or to enroll.

### ***Delivery Options:***

📖 Learning takes place in a classroom.

### ***Completion Time:***

The estimated completion time for this course is 32 hours (four days).

## BENEFITS

Upon completion students will:

- » be qualified to receive the Electronics Technicians Association (ETA) Fiber Optic Technician-Outside Plant (FOT-OSP) Certification
- » earn BICSI ITS Continuing Education Credits
- » earn a Light Brigade Certification of Completion

### ***Ideal for:***

Technicians interested in advancing fiber installation skills and technology knowledge. This includes introductory content for FTTx and xWDM systems as well as OSP skills like emergency restoration and fiber characterization.

## COURSE OUTLINE

### **1. Safety**

Working with lasers, visual safety using fiber optic sources, working with optical fibers and chemicals

### **2. Terminology & Concept Review**

Theory, fiber, cable, connectors, splicing, fiber, cable management and installation

### **3. Trends in Fiber Optics**

Outdoor cable styles with ribbon fiber, microduct cables, aerial fiber optic cables, ADSS and OPGW cables, 200  $\mu$ m fiber, collapsible ribbon, complex architectures, improvements in FTTx and CWDM/DWDM

### **4. FTTx Fundamentals**

FTTx defined, FTTx economics, basic FTTx architecture, advanced FTTx architectures, centralized vs distributed splits and FTTx testing

(Continued)

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## COURSE OUTLINE *(Continued)*

- 5. Emergency Restoration**  
Types of fiber optic damage, frequently-encountered problems, failure rates of fiber optic systems, emergency restoration kit requirements, equipment used in the restoration role, premises restorations and post-restoration recommendations
- 6. Introduction to Fiber Characterization**  
Introduction to fiber characterization, fiber characterization defined, review of conventional testing protocols, chromatic dispersion, polarization mode dispersion and spectral attenuation
- 7. Lab Safety**  
Practice safety during the labs for yourself and your fellow participants
- 8. Cable Preparation**  
Prepare a stranded cable for butt-entry installation into a fiber closure/panel
- 9. Prep Panel/closure**  
Secure cables to closure/panel and route blue tube to splice tray
- 10. Fanout Kit**  
What is a fanout kit and how do I use it?
- 11. Splice Closures**  
Splice the blue tube fibers in the splice trays of the closures
- 12. Pigtails for Panel 1**  
Splice the blue tube fibers to pigtails in Panel 1
- 13. FuseConnects for Panel 2**  
Use FuseConnects to terminate the blue tube fibers in Panel 2
- 14. Splicer Menu Options**  
Review key splicer menu options
- 15. Mid-entry Cable Preparation**  
Prepare a stranded cable for mid-entry installation into a fiber closure/panel
- 16. Mid-entry Closure Preparation**  
Secure cables to closure and route blue tube to splice tray
- 17. OTDR Overview**  
Discuss functions, features, limitations and accessories for effective OTDR usage
- 18. OTDR Testing**  
Use an OTDR to test and identify issues with the class-built fiber span
- 19. Optical Loss Budgets**  
Create a loss budget for the classroom assembled link
- 20. Optical Loss Testing**  
Determine optical loss for the classroom assembled link and compare to the calculated loss budget
- 21. Fiber Identifier**  
Use a fiber identifier to prevent cutting a live fiber
- 22. VFL**  
Use a visual fault locator to find failures in the classroom assembled link
- 23. Documentation**  
Discuss documentation that may be required on the job
- 24. Ribbon Splicing**  
Fusion splice ribbon fiber



Produced in Conjunction with

**LIGHT BRIGADE**



# Certified Fiber to the Home Professional – CLASSROOM

## OVERVIEW

This course features 16 hours of classroom lecture with an experienced FTTH instructor. Students will gain a broad base of knowledge and familiarity with FTTH architecture, network design, deployment technology and operational skills. The course is intended for network designers, network planners, supervisors and project managers that will be involved in deploying and maintaining FTTH and FTTB networks.

## CERTIFICATIONS

- » FTTH Council's Certified Fiber to the Home Professional (CFHP) Certification
- » Light Brigade Certification of Completion

## CLASSROOM COURSE OUTLINE

### 1. Applications

Planning and design of the FTTH network, fiber optic transmission, today's applications, fiber to the home, fiber to the business/building, drivers behind FTTx, the evolution from POTS to fiber, FTTx origins and evolution, TPO (telephony PON), fiber to the curb, cable television and radio frequency over glass

### 2. Bandwidth Issues

The demand for bandwidth, technology in transition, analog to digital video, SDTV and HDTV, multimedia convergence for the IP network, over the top video, next generation 3D HDTV, IP video delivery, telecommuting, interactive technologies, high bandwidth users, cloud computing, storage and cell towers

### 3. Economics

Defining CAPEX and OPEX, FTTH and FTTB CAPEX items, design impacts, who's implementing FTTH?, triple play network characteristics, cost comparisons, migration path considerations, FTTH and FTTB OPEX items, power, network management systems, mean time between failure, maintenance issues, operations software, interface software, quality of service, OPEX and CAPEX costs

### 4. Theory and Fibers

The three big issues, attenuation, causes for intrinsic and extrinsic losses, dispersion, fresnel reflection, rayleigh backscatter, lightwave transmission, single-mode fiber characteristics, single-mode fiber with laser source, mode field diameter, ITU-T G.652 single-mode optical fiber, ITU-T G.652D single-mode optical fiber, ITU-T G.657 single-mode optical fiber, ITU-T G.655 single-mode optical fiber, smart grid and energy management, future trends, ODN capabilities, user density and solutions

### 5. FTTH Standards

System standards, TCP/IP, MPEG – IPTV, active Ethernet, full service access network, ITU-T G.983 B-PON, asynchronous transfer mode (ATM), ITU-T G.984 G-PON, IEEE 802.3ah EPON, RF video overlay, DOCSIS, radio frequency over glass, next generation networks, ITU-T G.987 and G.988 10G-PON, WDM options, 40 GbE and 100 GbE, telcordia generic requirements, physical layer standards, ITU-T G.652, G.655 and G.657, ITU-T G.671, outside plant standards, North American codes, proper aerial route planning and engineering, TIA-568 and TIA-569

(Continued)

## RECOMMENDED PREREQUISITE

- » The course requires basic knowledge of fiber optic theory and terminology, as well as field experience, equivalent formal training such as the *Fiber Optics 1-2-3* course, *Fiber Optics Workshop* or viewing the *Light Brigade Staff Development* DVD set.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## CLASSROOM COURSE OUTLINE *(Continued)*

### 6. Network Topologies

The physical topologies, point to point topologies, star topology, PON star configurations, reach extender, route redundancy, ring, mesh and bus topology

### 7. Network components

Active devices, typical transmitter types, optical return loss and the ODN, erbium-doped fiber amplifiers, photodetectors, OLTs and ONTs, fiber optic passive devices, WDMs and PON systems, coarse, wide and dense WDM, PON configurations for WDM, filters and gratings, diplexers, triplexers and quadplexers, splitters, planar lightwave circuits, optical bands and windows and wavelength allocations

### 8. Cables

FTTx distribution and drop cables, outside plant cables, high fiber count cables, aerial fiber optic cables, FTTx drop cables, indoor/outdoor cables, FTTB/MDU premises installations, distribution cables, plenum, riser and LSZH cables, fiber optic cable cordage, fiber and buffer color codes, cable handling and FTTx installation disciplines

### 9. Cable Management

Fiber optic interconnect hardware, outside plant cable management, patch panels, splice panels, optical entrance enclosures, distribution panels, fiber distribution hubs, pedestals, vaults and handholes, splice closures, multiport service terminals, fiber transition terminals, FTTB panels, cabinets for active Ethernet, cable storage methods, hardened connector slack storage, panel and closure issues

### 10. Cable and Fiber Termination

Managing termination costs, splicing for the FTTx system, traditional splice scenarios, drop cable splicing, extrinsic splice and connection attenuation, fusion and mechanical splicing, ribbon splicing technology, pigtail splicing, splice protection, main connector components, fiber optic connector polishes, common FTTx connectors, hardened connectors, small form factor LC connectors, multifiber connectors, field terminable FTTH connectors, fiber optic cleaning methods, attenuators and terminators

### 11. Splitter Placement

FTTH planning, take rate, growth strategies for PON, migration strategy, splitter flexibility, FTTH design engineering, fiber management, rural applications, slack storage, MDUs and MTUs, outdoor splitter and hub location, centralized and distributed splitter in FTTB

### 12. Network Design

Designing FTTx systems, selecting transmission protocol, proper aerial route planning and engineering, active Ethernet P2P networks, growth strategies, migration, FTTH PON design engineering, FTTH outside plant design, splitter location, FTTH home run management, FTTH centralized splitter management, FTTH distributed topology, sales and construction planning, project chronology, writing OSP specifications, fiber management specifications, fiber cable management, cable mid-entry planning and specifying termination options

### 13. Fiber to the Building

High-rise MDU/MTU, medium-rise MDU/MTU, low-rise MDU/MTU, horizontal MDU/MTU, FTTB systems and design goals, FTTB MDU existing infrastructure, telecommunications rooms and closets, telecommunications enclosure, backbone hierarchical star topology, FTTB MDU installation and termination, cable structure and fiber counts, end user locations, solutions to get cabling to each user, optical network terminals and access points, aesthetics and termination techniques

### 14. Loss Budgets

Impacts on signal quality, loss budgets for FTTP networks, fiber, splitter and WDM specifications, active components, active Ethernet, PON classes, class B+ and C+ specifications, differential optical path loss, PON loss budgets, B-PON specifications, EPON specifications, G-PON specifications, XG-PON specifications, 10GEPON specifications, RFoG loss budgets, tapered loss budgets and reach extension

### 15. Test Disciplines

FTTH testing and troubleshooting, network test and equipment, testing active Ethernet, testing PON systems, testing FTTH/PON, optical loss test sets, PON power meters, optical loss testing, optical power measurements, OTDR testing, splitter signatures, reflection testing, visual inspection, documentation, visual laser testing requirements, troubleshooting with a visual fault locator, troubleshooting PON and AE systems, system test points, system related problems and service activation testing



Produced in Conjunction with

LIGHT BRIGADE



# Certified Fiber to the Home Professional – ONLINE COURSE

## OVERVIEW

This course is focused to network designers, network planners, supervisors and project managers that will be involved in deploying and maintaining FTTH and FTTB networks. Students will gain a broad base of knowledge and familiarity with FTTH architecture, network design, deployment technology and operational skills.

This **online training program** is comprised of modules that allow the student to grasp key concepts at their own pace and gauge their mastery through knowledge questions, culminating in a 75-question practice exam. It is ideal for remote and international students, providing valuable training without the expense or inconvenience of travel.

The comprehensive online training course covers the same material as our Certified Fiber to the Home Professional (CFHP) instructor-led classroom training, including the following topics:

- » bandwidth and economic issues
  - » evolution of fiber-to-the-home networks
  - » basic fiber optic theory
  - » FTTH architectures and topologies
  - » network components
  - » fiber and cable management
- » termination options
- » network design
- » loss budgeting
- » test equipment and test procedures

### **Completion Time:**

After registering online, you will be given a log in and password unique to you. **You will have 90 days to complete the course** — but it can be completed in a single weekend if you choose. Take each module at your own pace, review completed modules and retake practice exams at your convenience.

## CERTIFICATIONS

- » Upon completion of this program, the student will have the necessary knowledge to successfully complete the CFHP certification exam available on the Fiber to the Home Council's website. (\$150)
- » Light Brigade Certification of Completion

## COURSE OUTLINE

### 1. Applications

Planning and design of the FTTH network, fiber optic transmission, today's applications, fiber to the home, fiber to the business/building, drivers behind FTTx, the evolution from POTS to fiber, FTTx origins and evolution, TPO (telephony PON), fiber to the curb, cable television and radio frequency over glass

### 2. Bandwidth Issues

The demand for bandwidth, technology in transition, analog to digital video, SDTV and HDTV, multimedia convergence for the IP network, over the top video, next generation 3D HDTV, IP video delivery, telecommuting, interactive technologies, high bandwidth users, cloud computing, storage and cell towers

(Continued)

## RECOMMENDED PREREQUISITE

- » The course requires basic knowledge of fiber optic theory and terminology, as well as field experience, equivalent formal training such as the **Fiber Optics 1-2-3** course, **Fiber Optics Workshop** or viewing the **Light Brigade Staff Development** DVD set.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## CLASSROOM COURSE OUTLINE *(Continued)*

### 3. Economics

Defining CAPEX and OPEX, FTTH and FTTB CAPEX items, design impacts, who's implementing FTTH?, triple play network characteristics, cost comparisons, migration path considerations, FTTH and FTTB OPEX items, power, network management systems, mean time between failure, maintenance issues, operations software, interface software, quality of service, OPEX and CAPEX costs

### 4. Theory and Fibers

The three big issues, attenuation, causes for intrinsic and extrinsic losses, dispersion, fresnel reflection, rayleigh backscatter, lightwave transmission, single-mode fiber characteristics, single-mode fiber with laser source, mode field diameter, ITU-T G.652 single-mode optical fiber, ITU-T G.652D single-mode optical fiber, ITU-T G.657 single-mode optical fiber, ITU-T G.655 single-mode optical fiber, smart grid and energy management, future trends, ODN capabilities, user density and solutions

### 5. FTTH Standards

System standards, TCP/IP, MPEG – IPTV, active Ethernet, full service access network, ITU-T G.983 B-PON, asynchronous transfer mode (ATM), ITU-T G.984 G-PON, IEEE 802.3ah EPON, RF video overlay, DOCSIS, radio frequency over glass, next generation networks, ITU-T G.987 and G.988 10G-PON, WDM options, 40 GbE and 100 GbE, telcordia generic requirements, physical layer standards, ITU-T G.652, G.655 and G.657, ITU-T G.671, outside plant standards, North American codes, proper aerial route planning and engineering, TIA-568 and TIA-569

### 6. Network Topologies

The physical topologies, point to point topologies, star topology, PON star configurations, reach extender, route redundancy, ring, mesh and bus topology

### 7. Network components

Active devices, typical transmitter types, optical return loss and the ODN, erbium-doped fiber amplifiers, photodetectors, OLTs and ONTs, fiber optic passive devices, WDMs and PON systems, coarse, wide and dense WDM, PON configurations for WDM, filters and gratings, diplexers, triplexers and quadplexers, splitters, planar lightwave circuits, optical bands and windows and wavelength allocations

### 8. Cables

FTTx distribution and drop cables, outside plant cables, high fiber count cables, aerial fiber optic cables, FTTx drop cables, indoor/outdoor cables, FTTB/MDU premises installations, distribution cables, plenum, riser and LSZH cables, fiber optic cable cordage, fiber and buffer color codes, cable handling and FTTx installation disciplines

### 9. Cable Management

Fiber optic interconnect hardware, outside plant cable management, patch panels, splice panels, optical entrance enclosures, distribution panels, fiber distribution hubs, pedestals, vaults and handholes, splice closures, multiport service terminals, fiber transition terminals, FTTB panels, cabinets for active Ethernet, cable storage methods, hardened connector slack storage, panel and closure issues

### 10. Cable and Fiber Termination

Managing termination costs, splicing for the FTTx system, traditional splice scenarios, drop cable splicing, extrinsic splice and connection attenuation, fusion and mechanical splicing, ribbon splicing technology, pigtail splicing, splice protection, main connector components, fiber optic connector polishes, common FTTx connectors, hardened connectors, small form factor LC connectors, multifiber connectors, field terminable FTTH connectors, fiber optic cleaning methods, attenuators and terminators

### 11. Splitter Placement

FTTH planning, take rate, growth strategies for PON, migration strategy, splitter flexibility, FTTH design engineering, fiber management, rural applications, slack storage, MDUs and MTUs, outdoor splitter and hub location, centralized and distributed splitter in FTTB

### 12. Network Design

Designing FTTx systems, selecting transmission protocol, proper aerial route planning and engineering, active Ethernet P2P networks, growth strategies, migration, FTTH PON design engineering, FTTH outside plant design, splitter location, FTTH home run management, FTTH centralized splitter management, FTTH distributed topology, sales and construction planning, project chronology, writing OSP specifications, fiber management specifications, fiber cable management, cable mid-entry planning and specifying termination options

*(Continued)*



## CLASSROOM COURSE OUTLINE *(Continued)*

### 13. Fiber to the Building

High-rise MDU/MTU, medium-rise MDU/MTU, low-rise MDU/MTU, horizontal MDU/MTU, FTTB systems and design goals, FTTB MDU existing infrastructure, telecommunications rooms and closets, telecommunications enclosure, backbone hierarchical star topology, FTTB MDU installation and termination, cable structure and fiber counts, end user locations, solutions to get cabling to each user, optical network terminals and access points, aesthetics and termination techniques

### 14. Loss Budgets

Impacts on signal quality, loss budgets for FTTP networks, fiber, splitter and WDM specifications, active components, active Ethernet, PON classes, class B+ and C+ specifications, differential optical path loss, PON loss budgets, B-PON specifications, EPON specifications, G-PON specifications, XG-PON specifications, 10GEPON specifications, RFoG loss budgets, tapered loss budgets and reach extension

### 15. Test Disciplines

FTTH testing and troubleshooting, network test and equipment, testing active Ethernet, testing PON systems, testing FTTH/PON, optical loss test sets, PON power meters, optical loss testing, optical power measurements, OTDR testing, splitter signatures, reflection testing, visual inspection, documentation, visual laser testing requirements, troubleshooting with a visual fault locator, troubleshooting PON and AE systems, system test points, system related problems and service activation testing

### 16. Network Trends

Describe the difference between XG-PON and NG-PON networks, briefly explain the impact of 5G, describe the basic principles behind optical transmission keys, explain rogue ONT behavior and identify steps involved when migrating to NG-PON



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## CLASSROOM COURSE OUTLINE *(Continued)*

### 13. Fiber to the Building

High-rise MDU/MTU, medium-rise MDU/MTU, low-rise MDU/MTU, horizontal MDU/MTU, FTTB systems and design goals, FTTB MDU existing infrastructure, telecommunications rooms and closets, telecommunications enclosure, backbone hierarchical star topology, FTTB MDU installation and termination, cable structure and fiber counts, end user locations, solutions to get cabling to each user, optical network terminals and access points, aesthetics and termination techniques

### 14. Loss Budgets

Impacts on signal quality, loss budgets for FTTP networks, fiber, splitter and WDM specifications, active components, active Ethernet, PON classes, class B+ and C+ specifications, differential optical path loss, PON loss budgets, B-PON specifications, EPON specifications, G-PON specifications, XG-PON specifications, 10GEPON specifications, RFoG loss budgets, tapered loss budgets and reach extension

### 15. Test Disciplines

FTTH testing and troubleshooting, network test and equipment, testing active Ethernet, testing PON systems, testing FTTH/PON, optical loss test sets, PON power meters, optical loss testing, optical power measurements, OTDR testing, splitter signatures, reflection testing, visual inspection, documentation, visual laser testing requirements, troubleshooting with a visual fault locator, troubleshooting PON and AE systems, system test points, system related problems and service activation testing



*Produced in Conjunction with*

**LIGHT BRIGADE**



# FTTx for Installers and Technicians

## OVERVIEW

This four-day class has been developed with 16 hours of classroom lecture and 16 hours of hands-on skills labs to provide practical understanding and skills required to install, test and troubleshoot PON and active Ethernet FTTx systems according to ITU, IEEE and SCTE standards. Students will perform bidirectional testing, WDM testing and splitter testing with the latest FTTx test equipment such as PON power meters and optical time-domain reflectometers.

## CERTIFICATIONS AND CREDITS

- » Electronics Technicians Association (ETA) Fiber Optic Technician-Outside Plant (FOT-OSP) Certification [\$150]
- » 18 BICSI ITS Continuing Education Credits
- » 3 SCTE Recertification Units
- » Light Brigade Certification of Completion

## CLASSROOM COURSE OUTLINE

### 1. Introduction to Fiber Optics

Basic fiber optic terminology, FTTx optical fiber transmission systems, typical transmission rates, fiber optic symbols, why use fiber optics, fiber optic standards and brief history of fiber optics

### 2. FTTx PON Methodology

Basic FTTx terminology, passive optical networks (PON), fiber to the home, fiber to the business/building, POLAN, fiber to the curb, IP video delivery, active Ethernet, TDM and TDMA, broadband PON (B-PON), asynchronous transfer mode (ATM), Ethernet PON, gigabit PON (G-PON), 10G-PON, 10 gigabit EPON, RF video overlay, radio frequency over glass (RFoG) and WDM-PON

### 3. Topologies

Network topologies, physical topologies, point-to-point topology, star topology, reach extender, route redundancy, ring topology, mesh topology and bus topology

### 4. Optical Distribution Network (ODN) and OSP

ODN capabilities, outside plant cable management, drop terminator and cable and fiber management

### 5. Fiber Theory

The three big issues, attenuation, fresnel reflection, refraction, numerical aperture, intrinsic and extrinsic losses, the electromagnetic spectrum, lightwave transmission, single-mode step-index fibers, mode field diameter and dispersion (pulse spreading)

### 6. Fiber

Optical cable for FTTx, FTTx distribution and drop cables, outside plant cables, high fiber count cables, aerial fiber optic cables, indoor/outdoor cables, plenum and riser cables, low smoke zero halogen, distribution cables, fiber optic cable cordage and fiber and buffer color codes

### 7. Cable

Outside plant, underground, aerial and premises / LAN

### 8. Connectors

Extrinsic splice and connection attenuation, fiber optic connector polishes, common FTTx connectors, small form factor LC connectors, multifiber connectors, field terminable FTTH connectors, hardened connectors, connector inspection and cleaning, terminators and attenuators and single-mode field connectorization issues

*(Continued)*

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the-art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





### **9. Splicing**

Traditional splice scenarios, drop cable splicing, good splice requirements, fiber cleaving, fusion, ribbon and pigtail splicing, protecting the splice and mechanical splices

### **10. Fiber and Cable Management**

Panels, closures and cabinets, fiber optic interconnect hardware, splice tray recommendations, FTTx OSP cable management products, cabinets for active Ethernet, network access points, slack storage, vaults and handholes, indoor slack storage methods, underground cable storage, aerial cable storage products and hardened connector slack storage

### **11. Passive Devices**

Fiber transition to the network, planar lightwave circuits, fused biconical taper splitters, splitter challenges and scenarios, tap splitters, WDMs and PON systems, optical bands and windows, wavelength allocations, multiplexing and demultiplexing, filters and gratings, types of WDMs, PON configurations for WDM, RF video overlay, diplexers, triplexers and quadplexers and coarse, dense and wide WDM

### **12. Active Devices**

Fiber optic transmitters, distributed feedback lasers, Fabry-Perot lasers, fiber optic receivers, photo diodes, Erbium-doped fiber amplifiers, reflection issues, optical return loss and the ODN

### **13. Optical Line Terminals (OLTs) and Optical Network Terminals (ONTs)**

OLTs, ONT, NT and ONU, UPS and battery backup systems

### **14. Loss Budgets**

Designing FTTx systems, writing OSP specifications, loss budgets for FTTx networks, safety margins, “Not to exceed” charts for single-mode, active Ethernet specifications, PON loss budgets, G-PON specifications, G-PON power levels, Ethernet specifications, RFoG and tapered loss budgets

### **15. Installation**

FTTx cable installation, cable handling, standards and regulations, underground installation techniques, direct buried, conduit and duct installation, cable pulling methods, tension monitoring, high air speed blown, air blown fiber, aerial installation techniques, mid-span (express) entries, cable installation products, FTTB installation techniques, MDUs and MTUs, FTTB design goals, telecommunications rooms, get cabling to each user, termination techniques, aesthetics, ONTs and access points and installation inspection reports

### **16. Testing**

Testing active Ethernet, testing PON systems, initial installation testing, testing equipment for different scenarios, “Not to exceed” values, OTDR testing, dynamic range, deadzone, OTDR signatures, key points to understanding IOR, post-installation testing with the OTDR, testing drop cables, reflection testing, measuring reflectance with a deadzone box, optical loss testing, insertion loss method, visual laser testing requirements and visual inspection

### **17. Maintenance**

Identify – locate – resolve, typical causes of failure, system related problems, eye diagrams, types of fiber optic damage, typical cable system faults, equipment used in the restoration role, emergency restoration kit requirements, aerial restoration, outside plant restorations, the need for slack cable, effective maintenance postures and post-restoration recommendations

### **18. Safety**

Fiber optic safety concerns, visual safety using fiber optic sources, wavelength of the eye, laser classifications, working with lasers and optical fibers, personal protective equipment, chemicals, material safety data sheets (MSDS), work area safety and installation practices

## **SKILLS LAB OUTLINE**

### **WORKSTATION #1 – CABLE MANAGEMENT**

- » cable preparation
- » mid-entry practices
- » closure preparation
- » panel dressing
- » splitter installation
- » splice tray fiber routing

*(Continued)*



## **WORKSTATION #2 – SPLICING**

- » strip and cleave processes
- » inline and pigtail splicing
- » FTTx splicing
- » fixed V-groove splicers
- » core alignment splicers

## **WORKSTATION #3 – OTDR TESTING**

- » OTDR use in FTTx installations
- » FTTx OTDR signatures
- » measuring reflectance
- » testing splitters

## **WORKSTATION #4 – OPTICAL LOSS TESTING**

- » FTTx test equipment
- » testing OLT/ONT power levels
- » test points in FTTx installations
- » upstream/downstream testing
- » troubleshooting
- » FTTx documentation



*Produced in Conjunction with*

**LIGHT BRIGADE**



# FTTx OSP Design

## OVERVIEW

This three-day class has been developed with 16 hours of classroom lecture and 8 hours of hands on design exercises to teach attendees to apply critical issues such as customer take rate and density to outside plant design. This course covers FTTH network field configurations, design benchmarks and installation parameters for active Ethernet and PON systems. Attendees will create their own FTTx network designs in classroom break-out sessions, applying the learned objectives to distributed split, centralized split, home run and point-to-point systems.

Please contact NCTI Customer Care at 866.575.7206 for dates and locations. Courses must be purchased at least two weeks in advance to avoid late fees. Discounts may be available for this course, please contact NCTI Customer Care to learn more and/or to enroll.

## CERTIFICATION

- » Qualified to receive the Fiber Broadband Association (FBA) FTTx OSP Design Certification
- » Light Brigade Certification of Completion

## COURSE OUTLINE

### 1. Introduction to FTTx

FTTx basics, fiber optic transmission, basic fiber optic terminology, the three big issues, lightwave transmission, FTTH formats, POLAN and PON generations

### 2. Optical Fiber

Fiber specifications, single-mode fiber characteristics, ITU-T G.652, ITU-T G.652D single-mode optical fiber and ITU-T G.657 single-mode optical fiber

### 3. Optical Cables

Cable designs, optical cable for FTTx, FTTx distribution and drop cables, high fiber count cables, aerial fiber optic cables, distribution cables, cable structure and fiber counts, fiber and buffer color codes, cable handling, outside plant cable management, fiber distribution hubs, pedestals, splice closures and multiport service terminals

### 4. Connectors and Splitters

Common FTTx connectors, small form factor LC connectors, multifiber connectors, hardened connectors, field terminated FTTH connectors, splice-on connectors, fiber optic connector polishes, splitter flexibility and splitter management

### 5. Fundamental Fiber Planning

Fundamental planning design steps, cost considerations, fiber and cable management, the ideal network location, central office location strategy, ideal hub/node placement, density and central office location, PON system design, configuring fiber routes, ideal feeder route configuration, cost variance from the ideal and typical outside plant fundamental planning

### 6. Futureproofing

Fiber cable sizing, what speed do we need to the home, full spectrum zero water peak fiber and FTTx needs stable reliable performance

(Continued)

## RECOMMENDED PREREQUISITE

- » The course requires basic knowledge of fiber optic theory and terminology, as well as field experience, equivalent formal training such as the *Fiber Optics 1-2-3* course, *Fiber Optics Workshop* or viewing the *Light Brigade Staff Development* DVD set.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## COURSE OUTLINE *(Continued)*

### 7. PON Design Options

Distributed split designs, determining the best solution, OLT and splitter relationship, pseudo cabinet concept, OLT and splitter relationship, fiber cable tapering, FTTx design efficiency and operational issues

### 8. Fiber to the Building

MDUs and MTUs, get cabling to each user, fiber in the building design goals, high-rise and medium rise buildings, mdu existing infrastructure, telecommunications room, MDU existing infrastructure, telecommunications room, mdu cabling systems, low rise and campus MDUs, typical cabinet design strategy, typical distributed split design strategy, splitter design for MDUs, end user locations, optical network terminals and access points and bend-insensitive fiber for FTTB

### 9. Single-family Residential Areas

PON areas, subdivision design strategies, typical drop layout and fiber drop design

### 10. Connectorization Options

Termination options, connectorized versus fusion splicing, conventional vs. plug-and-play, capital expenditures (CAPEX), administration, network performance, organizational considerations, developing a cost model and take rates

### 11. Rural Areas

Network design for rural areas, ideal hub/node placement, rural area network design, splitter placement and distribution, splitter field arrangement and conceptual example of reusing dead fibers

### 12. WDM-PON

ODN and OSP issues, the impact of WDM-PON, NG-PON and NG-PON2, TWDM-PON, point-to-point WDM, wavelength allocations, fiber implications, spectral flexibility, multiplexing and demultiplexing, WDM-PON design basics, home run design conversion, centralized design conversion, distributed split design conversion and PON to WDM-PON conversion

### 13. Design Steps

PON loss budgets, calculating network loss, optical loss budget example, general design steps, home run design steps, cabinet design steps and distributed design steps

### 14. Specifications

Product specification, partial fiber specification and typical optical cable specification sheet

### 15. Miscellaneous

ITU-T G.671, splitter specifications, WDM specifications, telcordia requirements, physical layer standards, outside plant standards, North American codes, proper aerial route planning and engineering and fiber quality



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**LIGHT BRIGADE**



# Fiber Characterization Fundamentals

## OVERVIEW

This two-day class combines classroom lecture and hands-on testing skills to provide an understanding of the principles behind building and maintaining high speed optical networks. Key parameters such as polarization mode dispersion (PMD), chromatic dispersion (CD) and optical return loss (ORL) need to be calculated in order to evaluate system capabilities and network upgrades to higher bit rate systems.

Please contact NCTI Customer Care at 866.575.7206 for dates and locations. Courses must be purchased at least two weeks in advance to avoid late fees. Discounts may be available for this course, please contact NCTI Customer Care to learn more and/or to enroll.

### **Delivery Options:**

📖 Learning takes place in a classroom.

### **Completion Time:**

The estimated completion time for this course is 16 hours (two days).

## BENEFITS

Upon completion students will:

» earn a Light Brigade Certification of Completion

### **Ideal for:**

Those involved with equipment or systems where fiber characterization is needed to ensure proper operation of 10 Gb/s or higher data rates

## COURSE OUTLINE

### **1. Introduction**

The three big issues, optical units, standards committees, high-speed transmission rates, SONET optical carrier rates, time domain multiplexing systems, wavelength dimension in WDM systems, optical fiber transmission system, four tiers of fiber industry providers, optical network enabling technologies, optical network evolution and evolving to the all-optical network

### **2. Optical Fiber**

Fiber optic system basics, lightwave transmission, fiber composition, mode field diameter, single-mode versus multimode, single-mode optical fibers, G.652 single-mode fiber, ITU-T G.652 and G.652D, pulse spreading, G.653 dispersion shifted SMF, single-mode fibers for DWDM technology, four wave mixing, G.655 nonzero dispersion-shifted fiber, ITU-T G.655, dispersion-compensating fiber and fiber optic color code standard

### **3. Connectors**

What to look for in a connector, typical connector roles, single-mode connector polishes, visual inspection equipment, visual safety using fiber optic sources, IEC 61300-3-35, fiber optic cleaning methods, optical return loss and the ODN, reflection testing and terminators

(Continued)

## RECOMMENDED PREREQUISITE

This class requires basic knowledge of fiber optic theory. It is intended for people involved with equipment or outside plant where fiber characterization is needed to assure proper operation of 10 Gb/s or higher data rates.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## COURSE OUTLINE *(Continued)*

### 4. Components Overview

Light sources – lasers, laser spectral width, Fabry-Perot lasers, distributed feedback lasers, direct and indirect modulation, pulse chirping, signal information in a light beam, reflection causes and issues, optical isolators, tunable lasers, laser safety, photodiodes, detector types, attenuators, bit error rate, system related problems and eye diagrams

### 5. Regeneration

Repeaters, regenerators and amplifiers, factors for regenerator usage, DWDM system spans, optical amplification and roles of optical repeaters

### 6. Optical Multiplexing

Wavelength division multiplexing, fiber optic transponders, fiber optic passive devices, multiplexing basics, coarse wavelength division multiplexing, dense wavelength division multiplexing, optical demultiplexing, fiber bragg gratings, optical circulators and system loss budgets

### 7. Dispersion

Dispersion power penalties, dispersion formulas, pulse spreading, modulation, pulse compression and broadening, pulse appearances, calculating dispersion penalty and dispersion in submarine systems

### 8. Chromatic Dispersion

Components of chromatic dispersion, chromatic dispersion compensation, dispersion-compensating fiber and modules, chromatic dispersion measurement, spectral group delay in the time domain and interferometry method

### 9. Polarization

Polarization mode dispersion, birefringence in fiber, linear polarization states, controlling polarization, Polarization-dependent loss, simple PMD calculations, PMD testing and measurement methods, complete PMD fiber characterization and PMD first order limits

### 10. Test Equipment

Optical loss test sets, optical talk sets, optical time-domain reflectometers, optical reflection, extrinsic loss and fiber tolerances, pulsewidth, OTDR signatures, fiber tolerance issues, resolving fiber versus cable length, reflection testing, measuring reflectance with a deadzone box, reflectometers, optical spectrum analyzers, multiwavelength meters, testing WDM networks, optical dispersion testing and testing 100G systems

### 11. The Future

New and future bandwidth demands, TCP/IP, 40/100G transmission, advanced technologies and trends

### 12. Dispersion Testing

Build and test an 80-km span with G.655 fiber, build and test a 50-km span with G.652 fiber, polarization mode dispersion testing, chromatic dispersion testing, test fiber spans with fiber mismatches and retest spans with dispersion compensating modules

### 13. Reflection Testing

Optical return loss, reflectance, documentation, polarization mode dispersion and chromatic dispersion



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# Emergency Restoration (Fiber Optics)

## OVERVIEW

An outage can cost thousands of dollars every hour the system is down — so it is critical to have a recovery program already in place for when problems do occur. Well-trained staff who are able to handle the emergency in a timely and cost-effective manner are an integral part of any restoration plan. This two-day instructor-led course focuses on fault location, troubleshooting and test equipment with a heavy emphasis on hands-on skills training that simulates actual field restorations for both retrievable and non-retrievable slack scenarios. After attending this class, you will have the tools and skills necessary for your organization to better deal with outages.

Please contact NCTI Customer Care at 866.575.7206 for dates and locations. Courses must be purchased at least two weeks in advance to avoid late fees. Discounts may be available for this course, please contact NCTI Customer Care to learn more and/or to enroll.

### **Delivery Options:**

📖 Learning takes place in a classroom.

### **Completion Time:**

The estimated completion time for this course is 16 hours (two days).

## BENEFITS

Upon completion students will:

» earn a Light Brigade Certification of Completion

### **Ideal for:**

Fiber optic technicians, engineers or managers who work in the OSP environment

## COURSE OUTLINE

### **1. Optical Network Failures**

Digital communications, failure rates of fiber optic systems, optical network failure causes, connectors, inspection and cleaning, using an inspection scope, transmitters, receivers, fusion splices, mechanical splices, splice closures and cabinets, macrobending, microbending, lightwave transmission, excessive dispersion, cable, types of cable damage, aerial cable failure modes, underground cable failures and indoor cable failures

### **2. HANDS-ON: Build a Network**

Build a fiber optic system consisting of two panels, one closure and 200 feet of cable

### **3. Planning**

ER resources, internal and external personnel, equipment, test tools, OTDRs, documentation, the network lifecycle, purchasing and planning, physical versus logical route diversity, meshed networks, installation, the need for slack cable, cable storage products, route marking and documentation, GIS data, commissioning, provisioning, maintenance and troubleshooting, network monitoring systems, emergency restoration kits and standard tools for cable restoration

(Continued)

## RECOMMENDED PREREQUISITE

This course requires basic knowledge of fiber optic theory and terminology, as well as field experience and/or equivalent formal training such as Fiber Optics 1-2-3 or Utilities Level 1 Technician.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## COURSE OUTLINE *(Continued)*

**4. HANDS-ON: Build an Emergency Restoration Kit**  
Build an emergency restoration kit with a splice closure and 100 feet of cable

**5. Identifying and Locating**  
Identifying the event, personnel responsibilities, sectionalization, fault location flow charts, location tools, the OTDR, how the OTDR works, OTDR dynamic range, pulse width, location tips, nonreflective OTDR events, reflective OTDR events, nonreflective end of fiber, fiber roll-off, OTDR deadzone, OTDR accuracy and helix factor, calculating helix factor, finding the fault, improving accuracy in restorations, visual fault locators, execute emergency repairs, outage restoration, OSP emergency restoration, OSP restoration of ducted cable, OSP restoration of direct buried cable, underground restoration equipment, aerial restoration issues and mid-span entries for restorations

**6. HANDS-ON: Test and Repair a Failed Network**  
Measure span loss with an optical loss test set, use a visual fault locator to find a stressed or broken fiber, identify and locate events with an OTDR, locate and fix the simulated failure with built ERK

**7. Post-Restoration Tasks**  
Post-restoration recommendations, update documentation, restoration reports and records

**8. Wrap-up and Review**



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**LIGHT BRIGADE**



# Fiber Optics For Wireless

## OVERVIEW

This four-day instructor-led introductory course provides the foundation needed to understand fiber optic applications and challenges in the FTTA/cell site space. This course examines how fiber works and the fundamentals of different fibers, cables, connectors and other hardware used in fiber optic communication networks. All of this is with a focus on FTTA and small cell network applications. After learning the basics and the nuances of fiber within wireless networks, attendees will build skills and best practices in hands-on labs for fiber splicing, cable preparation, OTDRs and optical loss testing.

### **Delivery Options:**

📖 Learning takes place in a classroom.

### **Completion Time:**

The estimated completion time for this course is 32 hours (four days).

## BENEFITS

Upon completion students will:

- » be qualified to received ETA® International Fiber to Any Antenna Certification [\$155]
- » earn a Light Brigade Certificate of Completion

### **Ideal for:**

Installers, design engineers, project managers, field engineers or anyone who is managing or installing fiber for an FTTA/cell site.

## COURSE OUTLINE

### **1. Introduction to Wireless**

Wired technology, wireless technology, wired/wireless synergies and coverage versus capacity

### **2. Communications Basics**

Digital communications, optical fiber, fiber coatings, optical fiber color coding, basic units of measure in fiber optics, advantages and disadvantages and standards committees

### **3. Fiber Optic Transmission Theory**

The electromagnetic spectrum, fiber optic transmitters, fiber optic receivers, optical power, the dBm scale, loss and attenuation, refraction, total internal reflection, numerical aperture, optical reflection, optical dispersion, fiber tolerances and bandwidth

### **4. Optical Fibers**

The physical plant, fiber comparison, what is a mode, multimode fiber characteristics, multimode optical fiber types, application supported distance, single-mode fiber characteristics, mode field diameter, single-mode optical fiber types and dispersion in single-mode fibers

(Continued)

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available





## COURSE OUTLINE *(Continued)*

- 5. Cable**

Cable materials and structure, indoor optical cables, distribution cables, armored cable, breakout cables, fiber optic cable cordage, indoor/outdoor cables, loose tube outside plant cables, ribbon cables, microduct cables, aerial fiber optic cables, FTTx drop cables, typical optical cable specifications, fiber and buffer color codes, composite and hybrid cables and cable interconnection options
- 6. Connectors**

Main connector components, connector types, what to look for in a connector, typical connector roles, subscriber connector (SC), BFOC/2.5 (ST), LC connector, multifiber connectors, older connector styles, termination techniques, fiber optic connector inspection, cleaning methods, single-mode field connectorization issues, attenuators and terminators
- 7. Splicing**

Why we need to splice, the splicing sequence, splicing considerations, fiber cleaving, common fiber optic cleavers, fusion splicing, ribbon splicing, mechanical splicing, pigtail splicing and protecting a splice
- 8. Fiber and Cable Management**

Fiber management scenarios, rack and wall mount patch panels, splice panels, optical entrance enclosures, fiber distribution units, splice closures, splice trays, fanout and breakout kits, fiber raceway systems, work area media outlets, fiber to the building installations, OSP fiber and cable slack management, FTTx cable management products, fiber distribution hubs, fiber access terminals, multiport service terminals, fiber transition terminals, vaults and handholes, panel and closure considerations
- 9. Installation**

Cable handling, guidelines for fiber optic cable installation, standards, regulations and codes, air blown fiber, cabling buildings, cable trays and cable duct benefits and cable installation products
- 10. OSP Installation**

Underground installation techniques, proper route planning and engineering, conduit and duct installation, cable pulling methods, tension monitoring, air blown fiber, aerial installation, utility applications of fiber optics, mid-span (express) entries, storage methods and products and sequential markings
- 11. Test Equipment**

Optical loss test sets, optical time-domain reflectometers (OTDRs), key considerations for OTDRs, fiber identifiers, visual tracers, visual inspection, optical talk sets, optical dispersion testers and testing documentation
- 12. Optical Testing**

TIA-568 testing terminology, test methods, multimode launch conditions, optical loss testing with encircled flux or mandrel, reference test methods, insertion loss method, “not to exceed” charts, testing transmitter and receiver power, OTDR deadzone, OTDR signatures, gainers on OTDR traces, fiber roll-off, testing through fiber optic splitters, key points to understanding IOR and documentation fiber optics for wireless
- 13. Communication System Basics**

Fiber optic transmitters, laser light sources, light sources in multimode systems, laser and LED spectral width, reflection concerns, fiber optic receivers, typical span distances, repeaters, regenerators and amplifiers, basic components for optical transmission, optical splitters, WDMs and bidi devices, CWDM and DWDM
- 14. Loss Budgets**

Design options for fiber optic networks, safety margins, multimode system budgets, 10/40/100 gigabit networks, single-mode system budgets and loss budgets for FTTx networks (point-to-multipoint)
- 15. Macrocell**

Fiber to the tower architectures, tower installation and testing, installing hybrid cable to tower top, tower top connector inspection, sectors, shifting color codes, loopback testing and loopback devices
- 16. Microcell**

The migration to 5G, path to 5G via microcells and 5G radio spectrum
- 17. Distributed Antenna Systems (DAS)**

What is DAS, early DAS, DAS versus microcells, in-building DAS, passive DAS, active optical DAS, hybrid DAS, in-building coverage and placements, outdoor DAS (o-DAS), o-DAS in venues and o-DAS smart cities
- 18. Safety**

Fiber optic safety best practices, visual safety using fiber optic sources, wavelengths and the eye, laser classifications, working with lasers, safety eyewear, working with optical fibers, personal protective equipment, chemicals, safety data sheets (SDS), the work area, installation practices, aerial safety issues and RF safety
- 19. Fiber Splicing**

Fusion / mechanical / pigtail, fiber handling and cleaving
- 20. Cable Preparation**

Loose tube cable preparation, breakout and distribution cable preparation, patch panel and splice closure preparation and mid-entry practices

*(Continued)*



## **COURSE OUTLINE** *(Continued)*

### **21. OTDR Operation**

Acceptance testing, reflection testing, span testing and splice loss, emergency restoration and troubleshooting

### **22. Optical Loss Testing**

Link loss measurement, transmit and receive power, visual inspection and cleaning, variable and fixed



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**LIGHT BRIGADE**



# OTDR & Testing Deep Dive

## OVERVIEW

This two-day instructor-led course focuses on field testing and troubleshooting fiber optic spans/links and explains the various types of equipment and tools needed for acceptance testing, documenting performance and finding problems in a fiber physical plant. The emphasis is on understanding proper OTDR settings, overall testing and evaluating results.

### **Delivery Options:**

📄 Learning takes place in a classroom.

### **Completion Time:**

The estimated completion time for this course is 16 hours (two days).

## BENEFITS

Upon completion students will:

- » earn 12 BICSI ITS Continuing Education Credits
- » earn a Light Brigade Certificate of Completion

### **Ideal for:**

Installers, OSP technicians, maintenance techs, field supervisors or senior technicians

## COURSE OUTLINE

### **1. OTDR Theory and Operation: A Deep Dive**

Read OTDR signatures, choose the correct pulsewidth to maximize resolution, select and use launch and receive cables or terminators, determine helix factor in order to properly calibrate an OTDR to match sheath length, perform OTDR functions such as testing close-in events, manual cursor placement and bidirectional testing, use the OTDR to troubleshoot and locate breaks, use the OTDR for maintenance and restoration, perform advanced trace analysis and interpretation, complete an acceptance test of optical cables, properly prepare documentation and final test reports and live splice monitoring with OTDR

### **2. Cleaning, Inspection and Optical Loss Testing Best Practices**

Clean and inspect optical connectors on cable assemblies and in bulkheads using various methods, use software to analyze connector endfaces and provide pass/fail results, identify surface contamination, identify surface flaws, test transmit and receive power, calculate the dynamic range of a system, set up tier 1 testing using fiber appropriate reference methods, perform dual wavelength bidirectional optical loss testing, create overfilled and controlled launch conditions for multimode fiber using LEDs and VCSELs, identify live fibers and use tone identification, create a system loss budget and properly prepare documentation and final test reports

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » Fiber Optics 1-2-3 or field experience with fiber optic testing.

## TRAINING FEATURES

- » Professional instructors and technicians with real world practical experience
- » Small classes ensure valuable instructor/student interaction
- » State-of-the art equipment
- » Timely and relevant course materials
- » Long-term technical assistance available



# Advanced Technician

Part of the *Master Technician Certification Series*

## OVERVIEW

The NCTI Advanced Technician course teaches the broadband technician about the application of elements and principals that support operation of most broadband cable headends. Transmission lines, radio wave propagation, antennas, microwave systems and satellite communications are fundamental topics that technicians working in the headend must understand. While digital TV signals have become commonplace, there remains the need to understand analog TV signal processing, analog video analysis and FCC proof-of-performance execution. Digital TV related elements and topics are covered in lessons on digital satellite receivers, digital modulators, digital processors and equipment connection protocols. The Advanced Technician course prepares the technician that has previously worked only in the field for the transition to working inside today's sophisticated broadband cable headend.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 34 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to prepare for SCTE's Broadband Transportation Specialist (BTS) and Broadband Telecom Center Specialist (BTCS) certifications
- » earn four hours of college credit
- » receive credit toward NCTI® Master Technician certification
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe how headend system components work together to process analog and digital television services
2. apply governmental regulations and industry recommended practices to headend operation and maintenance
3. define what transmission lines are and the categories of transmission lines
4. describe how radio waves propagate over-the-air and through the atmosphere
5. describe antenna principles and how they apply to different antenna types
6. describe several applications of microwave communications and identify common microwave components
7. describe the basic operation of satellite communications systems
8. explain and apply headend theory of operation and how to connect analog and digital signal processing equipment
9. explain and apply proper headend combining and distribution techniques to downstream and upstream signals
10. describe various types of telecommunications transmission systems and their associated applications

(Continued)

## RECOMMENDED PREREQUISITE

- » System Technician

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Understanding Voice and Data Networks
- » Introduction to Networking Series
- » Advanced DOCSIS 3.1 Operations

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials enhanced with online videos
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

11. explain the NTSC analog video format
12. explain and apply FCC Technical Standards measurement requirements and NCTA Recommended Practices
13. configure a satellite receiver to receive programming
14. explain and apply the different interconnection protocols used in the headend

## COURSE OUTLINE

### 1. Examining Transmission Lines

Defining transmission lines, reviewing characteristic impedance and adjusting transmission line characteristics

### 2. Understanding Radio Wave Propagation

Introduction to understanding wave propagation, discussing components of the electromagnetic wave and explaining radio wave propagation through the atmosphere

### 3. Examining Antenna Principles

Defining basic antenna concepts, detailing how antennas transfer energy and optimizing antenna performance

### 4. Investigating Antenna Types

Categorizing antenna types, enhancing antenna performance, identifying wide-bandwidth antennas and evaluating mobile antennas

### 5. Examining Microwave Applications

Reviewing microwave fundamentals, transporting microwave signals through waveguide and applying microwave communications in broadband cable networks

### 6. Examining Microwave Components

Routing microwave signals, assessing microwave diodes and creating and processing microwave signals

### 7. Delving into Satellite Communications

Discussing basic concepts of satellite communications, recognizing applications for satellite communications, explaining the technologies of satellite communications and dissecting ground-based satellite antenna operation

### 8. Analyzing Analog TV Signals

Introducing composite color video signal characteristics, examining synchronizing pulses, examining signal separation and exploring television test signals

### 9. Equipment Connection Protocols

Examining digital interconnection protocols, creating flexibility in the headend and explaining digital program insertion

### 10. Understanding Signal Processors

Examining the carrier frequency conversion process, examining the analog television channel processor and explaining the processing digitally modulated carriers

### 11. Modulating and Demodulating Analog TV Signals

Examining modulation and demodulation, describing analog television modulation, examining the modulator and examining the demodulator

### 12. Digital Integrated Receiver/Decoders

Detailing satellite signal reception, examining the receiver in the integrated receiver/decoder, examining the decoder in the integrated receiver/decoder and configuring the integrated receiver/decoder

### 13. Transcoding Digital Broadcast Channels

Examining digital broadcast television, distributing digital broadcast television services on the broadband cable system and discussing ancillary data

### 14. Digital Modulators

Examining digital modulators, examining conditional access and examining applications of digital modulators

### 15. Combining Broadband Signals

Describing passive signal combining devices, describing downstream combining and describing upstream signal distribution in the headend

### 16. Analog Video Measurements and Testing

Characterizing the baseband video signal, examining video test equipment and test signals, executing baseband video measurements and recognizing alternative baseband video test equipment

### 17. Planning and Executing FCC

#### Proof-of-Performance Tests

Recognizing the FCC proof-of-performance testing requirements, applying the FCC proof-of-performance testing requirements to a broadband cable network, examining test descriptions and procedures, including the set-top box in the proof-of-performance test results and compiling the FCC proof-of-performance test results



# Broadband HFC Network Testing and Measurements

## OVERVIEW

This course provides the advanced student with a comprehensive understanding of system testing theory and application. The course concentrates on the use and selection of proper test equipment and application necessary for testing and complying with FCC and NCTA testing requirements and recommendations. It also focuses on equipment utilization for observing and locating analog and digital network problems. The student is exposed to the proper use, theory of operation, applications and measurement procedures for test equipment used in the network from the customer premises to the headend. The materials provided are also appropriate as a reference tool for those who need to understand more about testing procedures and terminology.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 30 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

- » service technicians
- » network technicians
- » fiber-optic technicians
- » headend technicians

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. perform broadband cable AC/DC voltage and resistance measurements using a DMM
2. use an SLM to troubleshoot a drop installation
3. interpret measured digital modulation channel parameters to determine if, and what, corrective action needs to be taken
4. list and describe measuring and controlling signal leakage
5. use a TDR to locate coaxial cable impedance mismatches and to confirm and identify unauthorized drop cable connections
6. comply with FCC Technical Standards and NCTA Recommended Practices for audio carrier center frequency separation and video carrier level measurements
7. measure chrominance to luminance gain and phase, differential gain and differential phase distortions
8. measure visual signal-to-coherent beats, test terminal isolation and measure hum in compliance with FCC Technical Standards and NCTA Recommended Practices
9. set proper sweep and telemetry injection levels and realize the importance of two telemetry paths

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Understanding Voice and Data Networks
- » Exploring Wireless Technologies
- » Introduction to Networking: Home & Peer-to-Peer Networks

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

10. interpret digital measurements with a digital signal analyzer to evaluate digital signal quality
11. perform tests using an optical power meter for measuring transmit and receive power
12. use an OTDR to confirm the performance of an optical link
13. set up the forward RF output level at an optical node

## COURSE OUTLINE

### 1. Operating Digital Multimeters

Defining types of DMMs, controls, components and specifications, measuring voltage, resistance and current and caring for and maintaining DMMs

### 2. Quantifying Digital Channel Quality

Defining digital measurements, considering digital modulation test instruments and interpreting digital modulation measurements

### 3. Detecting Signal Leakage

Reviewing signal leakage basics, selecting and operating signal leakage detection equipment and eliminating signal leakage

### 4. Measuring Signal Leakage

Reviewing signal leakage, examining signal leakage measurement equipment, identifying specific signal leakage measurement considerations and preventing and repairing signal leakage

### 5. TDR Fundamentals and Operation

Describing types of TDRs, understanding TDR theory of operation and applications, considering TDR preliminaries, noting TDR measurement precautions and learning measurement procedures and pinpointing fault site

### 6. Analog Video Measurements and Testing

Characterizing the baseband video signal, examining video test equipment and test signals, executing baseband video measurements and recognizing alternative baseband video test equipment

### 7. Sweeping Broadband Cable Networks

Describing network sweep, operating a sweep system and sweeping the downstream and upstream

### 8. Maintaining Return Path Signals

Examining return amplifier input levels, examining return amplifier output levels, examining the fiber node, adjusting upstream channel levels from the headend, injecting test carriers, describing equipment test points, injecting test carriers without interference, injecting return sweep pulses, explaining measurement methodology, considering test carrier injection, observing the balancing sequence, balancing the node, balancing a distribution amplifier and balancing the return path in a line extender

### 9. Examining Return Path Signals

Reviewing basic types of digital modulation, citing quadrature phase shift keying, detailing quadrature amplitude modulation, explaining bit rate, symbol rate, bandwidth, conceptualizing orthogonal frequency division multiplexing, controlling access to the media, delving into time division multiple access, achieving higher data throughput, employing ingress cancellation, discussing S-CDMA, reviewing set-top box return carriers, examining DOCSIS 1.0 and 1.1 return carriers, discussing DOCSIS 2.0 return carriers, analyzing DOCSIS 3.0 return carriers and assessing DOCSIS 3.1 return carriers

### 10. Recognizing Spectrum Analyzer Basics

Presenting the spectrum analyzer, recognizing spectrum analyzer operation and operating the spectrum analyzer

### 11. Planning and Executing FCC Proof-of-Performance Tests

Recognizing the FCC proof-of-performance testing requirements, applying the FCC proof-of-performance testing requirements to a broadband cable network, examining test descriptions and procedures, including the set-top box in the proof-of-performance test results and compiling the FCC proof-of-performance test results

### 12. Introducing Optical Test Equipment

Examining optical power meters, examining light sources, examining optical fiber identifiers, examining optical fiber talk sets and examining optical loss test sets

### 13. Presenting OTDR Basics

Overview, types, features and specifications

### 14. Performing OTDR Measurements

Performing preliminary procedures, recognizing OTDR signatures, programming the OTDR, understanding OTDR tests, conducting OTDR tests and making span measurements

### 15. Conducting Acceptance Testing of a Broadband Optical Link

Testing optical power and reflectivity, performing optical transmitter and receiver tests, examining scalable optical nodes and using documentation



# Understanding Voice and Data Networks

Part of the **Master Technician Certification Series** and **Telecom Specialist Certification Series**

## OVERVIEW

Understanding Voice and Data Networks presents the fundamental knowledge and concepts that are needed to expand a broadband career. Upon completion of the course, the student will understand the operation of data networks, telephone systems and Voice over Internet Protocol (VoIP) technologies.

### **Delivery Options:**

 Learning takes place online with the aid of a textbook. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 30 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for SCTE's Broadband Telecom Center Specialist certification
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Senior Master Technician certification
- » receive credit toward NCTI Telecom Specialist certification

### **Ideal for:**

- » network technicians
- » headend technicians
- » system technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. Explain how signals are transmitted over wires and fiber-optic cables
2. Explain how an Ethernet Local Area Network (LAN) works
3. Describe how data travels across the Internet
4. Describe the progress of a typical telephone call
5. Identify the common types of networking devices and explain the purpose and operation of each one
6. Describe how a voice telephone call differs from packet data transmission
7. Explain what converged networking is and identify the key technologies that make it possible
8. Describe the most common tools and techniques used to analyze and troubleshoot converged networks

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Broadband HFC Network Testing and Measurements
- » Introduction to Networking Series

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly-illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

### 1. Physical Communication Infrastructure

Communication and signals, internal computer components, software, network topologies, copper cable, fiber optic cable, cable and equipment installation and cables and connectors

### 2. A Layered System of Data Protocols

Protocols and the open systems interconnection (OSI) model, the physical layer, the data link layer, the network layer, the transport layer, the session layer, the presentation layer and the application layer

### 3. Data Networking Protocols

Local area network (LAN) data link protocols, Ethernet, point-to-point wide area network (WAN) services and switched WAN services

### 4. Data Networking Components

Repeaters and hubs, bridges, switches, routers and virtual local area networks (VLAN's) and network servers

### 5. TCP/IP Protocols and Services

The transmission control protocol/Internet protocol (TCP/IP) protocol suite, Internet protocol (IP), address resolution: address resolution protocol (ARP) and reverse address resolution protocol (RARP), user datagram protocol (UDP) and transmission control protocol (TCP), Internet addressing, subnetting fundamentals, IP routing, IP address management: bootstrap protocol (BOOTP), dynamic host configuration protocol (DHCP), and network address translation (NAT), and IP name resolution: HOSTS, domain name system (DNS) and Windows Internet naming service (WINS)

### 6. The Public Telephone Network

Local exchange components, central office switching, trunks, lines and loops, analog voice impairments, small office telephone equipment, private branch exchange (PBX), voice mail systems, signaling basics, signaling system seven (SS7) and integrated services digital network (ISDN)

### 7. Network Convergence

Packet telephony, general quality of service (QoS) concepts, overview of telecommunication standards, admission control and traffic shaping, traffic prioritization, H.323 standard for packet multimedia, H.323 call processing, session initiation protocol (SIP) and approaches to IP network QoS

### 8. Troubleshooting Converged Networks

Common network testing tools, a step-by-step method, troubleshooting a wiring problem, converged network failure points and a converged network troubleshooting example



# Exploring Wireless Technologies

## OVERVIEW

This course provides a comprehensive introduction to the underlying theory, design techniques and core principles of wireless system operation.

NCTI recommends that the student taking this course should have an understanding of electricity and electronics or have completed the Installer, Installer Technician and Service Technician courses of the NCTI technical career path. The student also should be familiar with computer networks, or have completed the NCTI course, Introduction to Networking: Local Area Networks.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 24 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Personnel who need to learn about new wireless technologies; wireless cable extensions, the wireless quad play or wireless networking, including:

- » broadband technicians
- » advanced services installers
- » technical management

## COURSE OBJECTIVES

Upon completing this course the student will be able to:

1. explain the role modulation plays in sending and receiving a message
2. describe the method of generating an AM signal
3. identify and explain the stages of a typical receiver and their functions
4. describe an automatic gain control circuit
5. determine the required bandwidth for an FM signal
6. find the radio wave horizon distance when given antenna height
7. understand the cause for fading and multipath reception
8. describe the concept of reciprocity in antenna theory
9. describe antenna radiation patterns
10. identify a dipole antenna and its transmission line interface
11. explain how antennas achieve gain and directionality
12. describe the effects of weather on microwave signals
13. name the modes of wireless access
14. list and discuss the characteristics and application of wireless local area networks (LAN) technologies

(Continued)

## RECOMMENDED PREREQUISITE

- » See Course Overview
- » Introduction to Networking: Local Area Networks

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Understanding Voice and Data Networks
- » Introduction to Networking: Peer-to-Peer Networks
- » Internetworking with TCP/IP

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
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## COURSE OUTLINE

### 1. Communications Systems

Reviewing the history of communications, exploring the meaning of communication, examining noise as a limiting factor, exploring bandwidth and channel allocations and examining communications systems considerations

### 2. Communications Circuits

Examining filters, tuned circuits and resonance, exploring oscillators and examining amplifiers

### 3. Amplitude Modulation

Examining the AM signal, AM transmitters and receivers, exploring single-sideband transmission and examining single-sideband receivers

### 4. Frequency Modulation

Examining frequency modulation, FM signal generation, exploring phase modulation, examining FM receivers and understanding phase-locked loops

### 5. Transmission Lines and Techniques

Examining types of transmission lines, understanding characteristic impedance, exploring resonance and examining transmission line losses

### 6. Radio Wave Propagation

Examining radio wave characteristics, propagation characteristics, exploring atmospheric conditions and communications and extending the communications range

### 7. Examining Antenna Principles

Examining antenna fundamentals, special characteristics of antennas and improving receive antenna signal-to-noise ratio

### 8. Investigating Antenna Types

Examining types of transmitting antennas, exploring antenna arrays, exploring other types of antennas and examining receiving antennas

### 9. Examining Microwave Applications

Introducing microwave fundamentals and exploring microwave transport systems

### 10. Examining Microwave Components

Exploring passive microwave components, examining microwave oscillator and amplifier components

### 11. Satellite Communications

Introducing basic concepts, examining satellite technologies and capacity and investigating system properties

### 12. Wireless Communications

Exploring the cellular mobile telephone system, comparing analog and digital access and identifying wireless applications and products



# Citizens Broadband Radio Service

## OVERVIEW

Due to the ever-increasing use of wireless communications, the Federal Communications Commission (FCC) designated a band of radio-frequency spectrum, from 3.5 gigahertz (GHz) to 3.7 GHz. This spectrum is used for a variety of mobile communications and is shared between government and private enterprises. This course will explain what CBRS is and how spectrum sharing is accomplished.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is 1.5 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Anyone wanting to learn about CBRS wireless spectrum and wireless spectrum management.

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain how the United States federal government became involved in managing and controlling the spectrum
2. describe how Microsoft influenced the communications industry and the management of the spectrum
3. describe how developing a nationwide radio spectrum controller better utilizes spectrum
4. understand the three-tier hierarchical structure of the CBRS methodology
5. explain the CBRS Spectral Access System (SAS) and how it works
6. identify the interfaces of the SAS and explain their basic functionality of each
7. describe how CBRS is the baseline for using real-time spectrum management

## COURSE OUTLINE

### **1. Citizens Broadband Radio Service**

Citizens broadband radio service (CBRS) overview, history of spectrum and the federal government, early spectrum management systems, wireless innovation forum spectrum management, CBRS hierarchical users, spectrum access system, logical SAS functionality and CBRS as baseline functionality

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# VLEO Satellite Wireless Access

## OVERVIEW

Very Low Earth Orbit (VLEO) satellite technology has come a long way over the last two decades. It is currently set to become a global competitor to traditional landline communications service providers. VLEO Internet service providers will provide high-speed data globally to virtually anyone on earth. The student of this course should already have a base knowledge of satellites, earth orbits and antenna technologies.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

- » broadband professionals

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe how the most common satellite orbits operate
2. describe the features of the VLEO satellite
3. describe the future characteristics of the VLEO satellite
4. explain the characteristics of global mesh networks
5. explain how VLEO carriers achieve faster connectivity
6. describe the features of self-installed antennas
7. explain the characteristics of multipath propagation
8. describe some of the opportunities for VLEO vendors
9. describe some of the challenges for VLEO satellites
10. list some of the competition VLEO vendors may face
11. identify regulatory agencies for VLEO satellites
12. identify current regulations in place for beyond the earth's orbit
13. describe some of the innovations that are being developed for the satellite industry

## COURSE OUTLINE

### **1. VLEO Satellite Wireless Access**

Satellite overview, VLEO technology and deployment and non-VLEO competition

## RECOMMENDED PREREQUISITE

- » Exploring Wireless Technologies

## RECOMMENDED PREREQUISITE

- » Citizens Broadband Radio Service (CBRS)

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# Introduction to Networking: Home and Peer-to-Peer Networks

Part of the *Master Dispatcher Certification Series*

## OVERVIEW

Introduction to Networking: Home and Peer-to-Peer Networks is designed for students who have a basic understanding of personal computers and their applications. By teaching the fundamentals of data networking and communications, the course explains how to build and operate a small computer network, typically found in a customer's home. In addition, the course identifies and describes the hardware, software, protocols and signals that are essential to understanding how data networks operate. The students are introduced to the Open Systems Interconnect (OSI) protocol and how the signals travel across the different layers of the protocol, carrying data from one device to another. Local Area Networks (LAN) and Wide Area Networks (WAN) are introduced along with Metro Ethernet, WiMAX and Cellular technologies. Networking terminology and acronyms are defined and explained throughout the course, which illustrates how the same key principles and components form the foundation of all networks, from the smallest peer-to-peer network to the Internet.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 16 hours. The maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Technical personnel supporting Internet-based services, including:

- » broadband technicians
- » network technicians
- » headend technicians
- » system technicians
- » level two call center technical support
- » NOC technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify the different types of networking hardware and software
2. describe the various physical and logical topologies used and discuss networking hardware and software implementation
3. discuss industry networking standards and enforcement

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Introduction to Networking: Wireless
- » Introduction to Networking: Local Area Networks
- » Internetworking with TCP/IP

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

4. explain how network signals are transmitted over wired and wireless networks
5. describe what protocols are and why they are necessary
6. describe the different types of addresses that computers use to send and receive information
7. explain the OSI Model and describe how information flows between two communicating computers
8. describe the technologies used in local area networks (LANs) and wide area networks (WANs)
9. identify Metro Ethernet, WiMAX and Cellular technology
10. identify the common types of networking devices and explain the purpose of each
11. explain how the Internet works in simple terms
12. understand how to build and operate a small peer-to-peer network
13. describe remote connectivity
14. identify common problems that can stop communications in a network

## COURSE OUTLINE

### 1. Computers and Software in Networks

Describe devices on networks and internal computer components: central processing units (CPU), input/output (I/O) hardware, memory and network interface cards (NIC), along with software and popular operating systems

### 2. Carrier Signals, Cable Types and Network Topologies

Review communication and signals, network topologies and overview of a structured wiring system

### 3. Computer Protocols and Services

Learn about protocols, layers of protocols and services and communicating across a network

### 4. The OSI Model

Introduction to the Open System Interconnect (OSI) model, the physical layer, the data link layer, the network layer, the transport layer, the session layer, the presentation layer and the application layer

### 5. Local Area Networks (LAN)

LAN data link protocols, Ethernet, token ring and FDDI, wireless LANs, LAN software architectures and information flow between client and server

### 6. Network Components

Repeaters and hubs, bridges, switches, routers and gateways

### 7. Wide Area Networks (WAN)

Point-to-point WAN services and switched WAN services

### 8. Integrating the Course Elements

Building a small, peer-to-peer network and expanding the small network



# Introduction to Networking: Local Area Networks

## OVERVIEW

Introduction to Networking: Local Area Networks explains the concepts, technologies and components used to build and maintain local area networks (LANs). Students completing this course will have a solid understanding of the fundamentals needed to build and maintain LANs. As a result, students are well prepared to support and operate LANs in customer premises and businesses.

Students will learn about Ethernet LAN protocols and concepts over different media including; coaxial cable, twisted-pair cable, fiber-optic cable and wireless. This course also introduces the network operating systems most widely used in local area networks: Windows, Linux and Mac OS. Additionally, the course covers the principles of network design and the roles of hubs, switches and routers to optimize network traffic. Lessons also include information on the elements of wireless LAN technologies, Ethernet Data Link protocols, 10 Gigabit Ethernet, Virtual LANs (VLANs) and Layer 3 switching.

### **Delivery Options:**

 Learning is a combination of online and textbook activities.

### **Completion Time:**

Varies based on the student's self-study pace; however, the maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » understand the different types of Ethernet networks
- » describe the tools necessary to analyze and troubleshoot computer networks
- » identify and explain the purpose of the common types of networking devices
- » have a basic understanding of how the Internet works
- » describe Internet protocols and their roles in establishing local area networks

### **Ideal for:**

Technical personnel supporting Internet-based services, including:

- » broadband technicians
- » network technicians
- » headend technicians
- » NOC technicians
- » system technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain the characteristics of the three types of physical media used in LANs (copper, fiber and wireless)
2. describe the operation of Ethernet local area networks
3. identify the different types of Ethernet protocol standards and explain

*(Continued)*

## RECOMMENDED PREREQUISITE

- » Introduction to Networking: Home and Peer-to-Peer Networks

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Internetworking with TCP/IP
- » Understanding Voice and Data Networks
- » Computers and Broadband Modems

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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## COURSE OBJECTIVES *(Continued)*

- their relationship to each other
4. explain the basic approaches of traffic isolation and broadcast containment in Ethernet LANs, including Quality of Service (QoS)
  5. identify the LAN architecture that best meets a user's requirements
  6. identify the primary advantages of the client/server networking model
  7. describe the key features and characteristics of Windows, Linux and Mac OS

## COURSE OUTLINE

### 1. Review of LAN Fundamentals

Network classifications and topologies, programs, the open systems interconnection (OSI) model and processes, protocols and layers

### 2. Connecting Computers

Network interface cards (NIC), review of cable properties, wireless local area networks (WLAN), media selection and installation and unshielded twisted-pair (UTP) patch cables and connectors

### 3. Ethernet LANs

Review of Ethernet, Ethernet frame format, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet, switched Ethernet configurations, virtual local area networks (VLAN) and Layer 3 switches

### 4. LAN Networking Software

Review of client/server and network operating system (NOS) fundamentals, remote procedure calls (RPC), file servers, print servers, web servers, other common servers and backup and disaster prevention

### 5. Network OS Software – The Windows Family

The Windows OS Architecture

### 6. Linux

Linux Architecture and Linux features

### 7. Mac OS Platform

Mac OS Platform overview and description of features

### 8. Analysis of LANs

Overview of the network development process, working with binary and hexadecimal numbers and LAN analysis and testing tools



# Internetworking with TCP/IP

## OVERVIEW

In order to enable a greater number and variety of services, broadband cable operators are utilizing Internet protocol (IP) technologies throughout their networks. Technicians called upon to support these technologies are required to understand how IP and related protocols work together to enable video, data and voice services in IP-based networks.

The Internetworking with TCP/IP course is the technicians guide to understanding the processes, protocols, and architectures associated with TCP/IP, the engine that runs the Internet. Geared toward anyone whose network accesses the Internet, the course introduces networking protocols, including transmission control protocol (TCP), hypertext transfer protocol (HTTP), file transfer protocol (FTP), network management protocols, email protocols and many others. The course also describes IP address classes and subnets, and how subnets are used to efficiently use IP addresses. Advanced routing protocols and the software packages that implement them are also described. After completing this course, the technician will understand how the different TCP/IP protocols are used to provide voice, video and data-related services in the broadband cable network and customer premises.

### **Delivery Options:**

 Learning is delivered online to your computer with a textbook provided.

### **Completion Time:**

The estimated completion time for this course is 16 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » understand how to test and troubleshoot IP-based communications systems
- » effectively design and implement systems to support email, file transfers, network management, web access and other TCP/IP services
- » successfully support voice, video and data services in IP networks
- » receive an industry-recognized NCTI® certificate of graduation
- » use this course to help prepare for SCTE's Broadband Telecom Center Specialist Certification

### **Ideal for:**

Technical personnel supporting Internet-based services, including:

- » broadband technicians
- » network technicians
- » headend technicians
- » system technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. recognize TCP/IP layers, components and functions and map them to the open systems interconnection (OSI) model

(Continued)

## RECOMMENDED PREREQUISITES

- » Introduction to Networking: Home and Peer-to-Peer Networks
- » Introduction to Networking: Local Area Networks

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Understanding Voice and Data Networks
- » Computers and Broadband Modems
- » Introduction to Networking: Wireless

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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Powers Frontline Performance



2. describe and implement TCP/IP application services that support email, network management, web access and file transport across routed IP networks
3. explain TCP/IP protocols used to transport data over intranets, extranets and the Internet
4. identify and use Internet navigation and search tools such as web browsers and HTTP as well as file transfer services such as FTP and trivial file transfer protocol (TFTP)
5. design and implement subnetworks
6. choose a routing protocol based on network size and service requirements, including quality of service/type of service (QoS/ToS) routing, variable-length subnet mask (VLSM) and link redundancy
7. describe TCP/IP support services, including Domain Name System (DNS) and dynamic host configuration protocol (DHCP)
8. use TCP/IP utilities to troubleshoot and isolate Internetwork communication failures
9. explain how TCP/IP supports converged voice and data networks

## COURSE OUTLINE

### 1. TCP/IP Structure Addressing

Open systems interconnection (OSI) model review, Internet protocol suite, Internet addressing and Internetworking devices

### 2. Overview of TCP/IP Applications

Summary of transmission control protocol/Internet protocol (TCP/IP) applications, web browsers and servers, file transfer protocol (FTP), email, network management and other applications

### 3. TCP/IP Addressing and Subnets

Number conversion and subnetting fundamentals along with address classes and classless interdomain routing

### 4. TCP/IP Protocols

IP, address resolution, address resolution protocol (ARP), user datagram protocol (UDP), transmission control protocol (TCP) and connection establishment and moving information across the network

### 5. TCP/IP Services

Domain Name System (DNS), Internet control message protocol (ICMP), Internet group management protocol (IGMP), dynamic host configuration protocol (DHCP), BOOTP, network address translation (NAT) and Internet protocol version 6 (IPv6)

### 6. Routing TCP/IP

IP Routing, routing information protocol (RIP), interior gateway routing protocol (IGRP), enhanced interior gateway routing protocol (EIGRP), open shortest path first (OSPF) and advanced routing

### 7. How TCP/IP Applications Work

Web browser and Web servers, file transfer protocol (FTP), simple mail transfer protocol (SMTP), network management and simple network management protocol (SNMP) architecture and packet multimedia standards

### 8. Troubleshooting a TCP/IP Network

Troubleshooting principles, ipconfig, ping, tracert, nbtstat, netstat, address resolution protocol (ARP), pathping and my trace route (MTR)



# Introduction to Networking: Wireless

## OVERVIEW

Wireless connectivity to a network has evolved from being a novel concept to an expectation in customer premises, businesses, retail outlets, community centers, airports, stadiums and arenas, etc. Consequently, in addition to knowing and understanding the operation of broadband cable, the technician is also expected to understand all the different possibilities for wireless network connectivity.

This study of wireless networking technology combines radio frequency (RF) and local area networking (LAN) fundamentals to explain the basic concepts and building blocks of wireless LANs. The student is introduced to wireless LAN infrastructure devices, antennas, access points, the 802.11 network architecture, Bluetooth, spread spectrum technology, governing bodies, troubleshooting, RF behavior, installation and security measures. This course targets both novice and experienced technicians who wish to gain a solid understanding of wireless networking to complement their knowledge of legacy connected networks.

NCTI recommends that the student taking this course should have an understanding of electricity and electronics or have completed Installer, Installer Technician and Service Technician. The student should also be familiar with computer networks or have completed the NCTI course Introduction to Networking: Home and Peer-to-Peer Networks and/or Introduction to Networking: Local Area Networks.

### **Delivery Options:**

 This course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 22 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » gain a solid understanding of wireless networking to complement their knowledge of traditional wired networking in both home and business applications
- » understand the different modes of wireless access
- » learn the fundamentals of RF, as well as the features and functions of wireless LAN components
- » gain the skills needed to install, configure and troubleshoot wireless LAN hardware, peripherals and protocols
- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Technical personnel supporting Internet-based services, including:

- » broadband technicians
- » network technicians
- » access bandwidth technicians
- » installer service and system technicians

(Continued)

## RECOMMENDED PREREQUISITE

- » Introduction to Networking: Home and Peer-to-Peer Networks

## RELATED COURSES

*Students completing this course should then enroll in:*

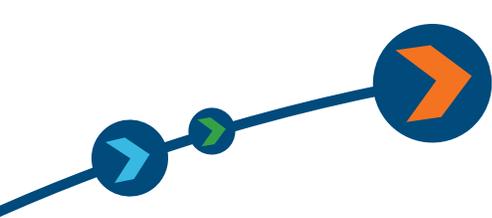
- » Understanding Voice and Data Networks
- » Computers and Broadband Modems
- » Internetworking with TCP/IP

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. define and apply the basic concepts of RF technology, including how spread spectrum technologies apply to wireless LANs
2. explain the fundamental principles and concepts behind installing, configuring and maintaining wireless LANs
3. describe the organizations and regulations that govern wireless LANs
4. list the different Wi-Fi standards through 802.11ac
5. demonstrate the necessary knowledge for complying with regulations that apply to setting up and maintaining a wireless LAN
6. install, set up and maintain a wireless network using various hardware devices, such as access points, bridges, gateways and antennas
7. analyze and troubleshoot the problems that can occur with wireless LAN data transmission, including multipath, hidden nodes and interference
8. secure the transmission of data over a wireless LAN and identify the different types of attacks that can occur from hackers

## COURSE OUTLINE

- 1. Introduction to Wireless LANs**  
The wireless LAN market and applications
- 2. RF Fundamentals**  
RF, Voltage Standing Wave Ratio(VSWR), principles of antennas and RF mathematics
- 3. Spread Spectrum Technology**  
Introducing spread spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS) and comparing FHSS and DSSS
- 4. Wireless LAN Infrastructure Devices**  
Access points, wireless bridges, wireless workgroup bridges, wireless LAN client devices, wireless residential gateways and enterprise wireless gateways
- 5. Antennas and Accessories**  
RF antennas, Point of Entry (PoE) devices and wireless LAN accessories
- 6. Wireless LAN Organizations and Standards**  
Federal Communications Commission (FCC), Institute of Electrical and Electronic Engineers (IEEE), major organizations and competing technologies
- 7. The 802.11 Network Architecture**  
Locating a wireless LAN, authentication and association, service sets and power management features
- 8. Physical Layers**  
How wireless LANs communicate, interframe spacing, Request to Send/Clear to Send (RTS/CTS) and modulation
- 9. Troubleshooting Wireless LAN Installations**  
Multipath, hidden node, near/far, system throughput, types of interference and range considerations
- 10. Wireless LAN Security**  
Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA) and Wi-Fi Protected Access II (WPA2), attacks on wireless LANs, emerging security solutions, corporate security policy and security recommendations
- 11. Site Survey Fundamentals**  
RF site surveys, preparing a site survey, site survey equipment, conducting a site survey and site survey reporting



# CompTIA ITF+

## OVERVIEW

This course introduces 21st century skills that everyone should have regarding computers, smartphones and computing devices. Concepts and terminology include the binary numbering system used by computers, how computing devices work and steps for troubleshooting, computing hardware and networking, operating systems (Windows, Mac, Linux android and iOS). Content includes a survey of application software as well as software development, database fundamentals and security.

Using this course, students come to better understand everything from file structure, software installation, Wi-Fi connectivity and troubleshooting in the overall setup, configuration and troubleshooting of computing devices.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 10 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for CompTIA ITF+ certification exam
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OUTLINE

1. How People Use Computers
2. System Hardware
3. Device Ports and Peripherals
4. Data Storage and Sharing
5. Understanding Operating Systems
6. Setting Up and Configuring a PC
7. Setting Up and Configuring a Mobile Device
8. Managing Files
9. Using and Managing Application Software
10. Configuring Network and Internet Connectivity
11. Security Threat Mitigation
12. Computer Maintenance and Management
13. IT Troubleshooting
14. Understanding Databases
15. Developing and Implementing Software

## TRAINING FEATURES

- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing



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# CompTIA A+

## OVERVIEW

CompTIA A+ certification is a popular entry point for people looking to work in IT. The certification requires you to pass two exams, the 220-1001 (Core 1) and 220-1002 (Core 2), but requires no experience or study. Students will be presented with an in-depth view of topics in Core 1 and Core 2.

- Core 1 topics covered in this course include computer hardware, mobile devices, iOS and Android operating systems, networking switches, routers and firewalls, virtualization, setting up a hypervisor, hardware and network troubleshooting.
- Core 2 lessons are concerned with computer operating systems (Microsoft Windows, Apple operating systems and Linux), security including proper firewall configuration and physical security, software troubleshooting and operational procedures.

Once completed, students will walk away with knowledge about how to repair and configure mobile devices, configuring hardware including monitors, CPUs, motherboards, RAM, etc., cloud computing and virtualization, setting up and configuring basic networks and troubleshooting hardware and network issues.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 40 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for CompTIA A+ certification exam
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OUTLINE

1. Safety and Professionalism
2. The Visible Computer
3. CPUs
4. RAM
5. Firmware
6. Motherboards
7. Power Supplies
8. Mass Storage
9. Implementing Mass Storage
10. Essential Peripherals
11. Building a PC
12. Windows Under the Hood
13. Users, Groups and Permissions
14. Maintaining and Optimizing Operating Systems
15. Working with the Command-Line Interface
16. Troubleshooting Operating Systems
17. Display Technologies
18. Essentials of Networking
19. Local Area Networking
20. Wireless Networking
21. The Internet
22. Virtualization
23. Portable Computing
24. Understanding Mobile Devices
25. Care and Feeding of Mobile Devices
26. Printers and Multifunction Devices
27. Securing Computers
28. Getting Organized

## TRAINING FEATURES

- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing



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# CompTIA Network+

## OVERVIEW

Understanding computer networks, their functions and their components is the focus of this course. Students will learn about cabling and topology, IP addressing, TCP versus UDP versus IGMP, SOHO routers, wireless networking, virtualization and cloud computing.

Course content covers different computing devices and network configurations and the concept of security and risk management. Using this course as a guide, students will be prepared to take the CompTIA Network+ examination with confidence. It is helpful that students have a basic familiarity with computer networks, but it is not required.

### ***Delivery Options:***



The course is delivered online. Lesson and final exams are taken online.

### ***Completion Time:***

The estimated completion time for this course is 30 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for CompTIA Network+ certification exam
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OUTLINE

1. Network Models
2. Cabling and Topology
3. Ethernet Basics
4. Modem Ethernet
5. Installing a Physical Network
6. TCP/IP Basics
7. Routing
8. TCP/IP Applications
9. Network Naming
10. Securing TCP/IP
11. Advanced Networking Devices
12. IPv6
13. Remote Connectivity
14. Wireless Networking
15. Virtualization and Cloud Computing
16. Mobile Networking
17. Building a Real-World Network
18. Managing Risk
19. Protecting Your Network
20. Network Monitoring
21. Network Troubleshooting

## TRAINING FEATURES

- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing



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# CompTIA Security+

## OVERVIEW

This course covers a broad, cross-section of topics related to security. It will appeal to students already in the information technology security field who are preparing for their examination as well as those just wanting to get into security. Students will learn about risk management, cryptography, access management, securing individual systems, intrusion detection, vulnerability assessments and business impact analysis. The course also introduces command-line utilities, tools for scanning network machines, protocol analyzers, Simple Network Management Protocol (SNMP) and using log files. Lastly, the course covers basic local area network (LAN) terms and protocols.

Upon completion of this course, students will be able to perform basic security configurations, describe computer security and its functions and become an effective team member of the security group in a business environment.

### ***Delivery Options:***

 The course is delivered online. Lesson and final exams are taken online.

### ***Completion Time:***

The estimated completion time for this course is 20 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for CompTIA Security+ certification exam
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OUTLINE

1. Risk Management
2. Cryptography
3. Identity and Access Management
4. Tools of the Trade
5. Securing Individual Systems
6. The Basic LAN
7. Beyond the Basic LAN
8. Secure Protocols
9. Testing Your Infrastructure
10. Dealing with Incidents

## TRAINING FEATURES

- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing



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# CompTIA CySA+

## OVERVIEW

This course will assist students pursuing the CompTIA CySA+ certification. With increasingly sophisticated attack methods, an analytics-based approach within the IT security has become important for most organizations.

Students will learn to hunt out threats, use digital forensics, identify business impacts and mitigate risks, implement network security protocols and manage vulnerabilities. Though not a requirement, it might be helpful to have a background or understanding of CompTIA A+, Network+ and Security+.

### **Delivery Options:**

 The course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 20 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for CompTIA CySA+ certification exam
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OUTLINE

1. Conducting Reconnaissance
2. Analyzing Reconnaissance Results
3. Responding to Network-Based Threats
4. Securing a Corporate Environment
5. Understanding Operating Systems
6. Analyzing Vulnerabilities Scan Results
7. Incident Response
8. Preparation Phase
9. Forensic Tools
10. Common Symptoms of Compromise
11. Incident Recovery and Post-Incident Response Process
12. Frameworks, Common Policies, Controls and Procedures
13. Identity and Access Management
14. Defense Strategies
15. Software Development Life Cycle (SDLC)
16. Tools and Technologies

## TRAINING FEATURES

- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing



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# CompTIA PenTest+

## OVERVIEW

This course will assist students pursuing the CompTIA PenTest+ certification. Different jobs, such as being a Penetration Tester, Vulnerability Tester, Security Analyst, Vulnerability Assessment Analyst, or working in Network Security Operations will require knowledge and skills learned in this course. As a prerequisite, students should already be familiar with some basic concepts regarding information security concepts or have experience working in various computing environments.

Students will learn how to plan and scope an assessment, including how to manage a testing project. Legal and compliance requirements related to testing are covered from the tester and client standpoints. Working through some penetration testing and using the correct tools is addressed to give students practical, hands-on experience. Students will analyze testing results and produce a written report with remediation techniques outlined. Lastly, the importance of identifying clear authority figures, key contacts, conflict resolution, technical assistance and escalation processes is presented as a means for keeping communication lines open.

### ***Delivery Options:***



The course is delivered online. Lesson and final exams are taken online.

### ***Completion Time:***

The estimated completion time for this course is 10 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for CompTIA Pen Test+ certification exam
- » receive an industry-recognized NCTI certificate of graduation

## COURSE OUTLINE

1. Planning and Scoping
2. Surveying the Target
3. Selecting Your Attack Vector
4. Selecting Pen Testing Tools
5. Reporting and Communication

## TRAINING FEATURES

- » Interactive eLearning with videos, animations, activities and engagements
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing



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# Cisco Broadband Access Center *(aka Prime Cable Provisioning)*

## PRICE

- » Individual: \$2,595
- » Custom course experience available for groups, please contact NCTI Customer Care for details.

## OVERVIEW

Cisco Prime Cable Provisioning [also known as Cisco Broadband Access Center (BAC)] provides a single platform for simplified management of cable subscriber devices and automated service provisioning. BAC functionality is now available as a component of Cisco's PRIME suite of network management applications.

BAC offers a centralized platform to control and configure CPE devices. Services include data provisioning for residential home gateways, cable modems and set-top boxes as well as voice provisioning for media termination adapters (MTAs) and digital voice adapters (DVAs). The platform also supports voice and data provisioning for Ethernet passive optical network (EPON) devices.

- » Please contact NCTI Customer Care for available dates, locations and times.
- » **You must provide your own laptop for both classroom and online activities.**

### **Completion Time:**

- » Three days

### **Ideal for:**

This course is designed for technical professionals who need to know how to deploy Cisco Broadband Access Center in a large-scale network.

The primary audience for this course includes:

- » Cable Operator Network Operation Center personnel
- » System Engineer/ Integrator/Solutions support personnel
- » Network Admins and Solution Architects
- » Channel partners, resellers

## COURSE OBJECTIVES

You will learn the Prime Cable Provisioning (PCP) architecture, PCP installation in a Linux environment, DOCSIS provisioning with PCP, configuring RDU Extensions using REST API, upgrading and migrating PCP components, CLI commands used for performance and traffic monitoring and perform key PCP configuration and verification tasks during hands-on labs. Each student lab pod is a dedicated multi-server environment.

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » TCP/IP networks, DNS and DHCP principles of operation
- » Basic Service Provider networking – including OSS/BSS functions
- » Cisco IOS Command Line Interface (CLI)

(Continued)





## COURSE OUTLINE

Course topics include the following:

1. Configuring CNR to use PCP
2. Installation of PCP on a Linux server
3. DOCSIS provisioning with PCP server components
4. DPE configuration
5. RDU configuration
6. Device bootup testing using device simulator tools
7. Upgrading and migrating PCP components
8. Configuring RDU data using REST API
9. Introduction to provisioning web services (PWS)
10. Groovy scripting and templates
11. Using log summary tools to get traffic and performance statistics
12. Data backups, redundancy and exporting
13. RDU extensions

The course description included in this document, including any specific content provided herein and any associated documentation provided to a client or prospective client, is confidential proprietary information of Sunset Learning Institute.



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INSTITUTE



# Implementing Cisco's Converged Cable Access Platform (cBR-8)

## PRICING/BUNDLES

- » All Prices are listed in US Dollars.
- » All prices subject to change\*\*
- » Individual Course Price: \$4,395
- » **Bundle with DOCSIS Network Overview: \$4,595**
  - Students enrolled in the **DOCSIS Network Overview** training course will learn about DOCSIS basics, modem operations, and the digital modulation schemes employed by DOCSIS. The Hybrid Fiber/Coax (HFC) network, which DOCSIS runs on in a cabled world, is also explored. The course provides a foothold to a deeper dive into DOCSIS.
    - The estimated completion time for this course is 2 hours.  
The maximum allotted time is four months from enrollment.
    - Upon completing this course, students will be able to:
      - Discuss how upstream RF levels are determined and maintained, and the impact of operating modems in a shared network.
      - Explain how the DOCSIS modem operates in the transmission path
      - Describe the role of cable and connectors in a distribution system
      - List and describe the role of passive signal transmission components in a distribution system
      - Describe different distribution system amplifiers and identify basic amplifier components
      - Explain basic system powering theory, identify power supply components and basic operation, and describe underground and aerial installations
      - Describe how a ring architecture using fiber-optic cable can maintain reliability
      - Recognize the HFC progressions that have brought fiber-optic cable closer to the customer premises
      - Understand why the broadband cable industry is developing its own PON (passive optical network) standard
      - Describe the primary digital modulation schemes used in broadband cable networks
- » **Bundle with DOCSIS Network Overview and Cisco Remote PHY Deep Dive (R-PHY): \$4,850**
- » Custom course experience available for groups, please contact NCTI Customer Care for details

## OVERVIEW

cBR-8 is the next generation in Cisco's series of CMTS (Cable Modem Termination System) platforms. Cisco's uBR 10K (Universal Broadband Router) previously offered industry-leading CMTS functionality – the cBR-8 is now Cisco's flagship CMTS offering. The Cisco cBR-8 CCAP (Converged Cable Access Platform) CMTS provides many technology advancements and performance enhancements, while reducing the overall

(Continued)

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » DOCSIS principles of operation
- » Cisco IOS Command Line Interface (CLI)





## OVERVIEW *(Continued)*

cost per subscriber. These advanced capabilities include: four times the capacity (number of cable modems/subscribers per CMTS) at double the speed of currently available DOCSIS 3.0 solutions (10K). The cBR-8 provides maximum flexibility for the future adoption of innovative network architectures including Remote PHY (RPHY), SDN and Virtual CMTS (vCMTS). The cBR-8's native support of DOCSIS 3.1 allows cable operators to deliver ultra-broadband services with maximum downstream speeds approaching 10 Gbps per subscriber and 1 Gbps upstream.

**Note:** Cisco 10K supports all versions up to DOCSIS 3.0. cBR-8 supports up to 3.1.

- » Please contact NCTI Customer Care for available dates, locations and times.
- » **You must provide your own laptop for both classroom and online activities.**

### **Completion Time:**

- » Four days

### **Ideal for:**

This course is designed for technical professionals who need to know how to deploy Cisco Broadband Access Center in a large-scale network.

The primary audience for this course includes:

- » Cable Operator Network Operation Center personnel
- » System Engineer/ Integrator/Solutions support personnel
- » Channel partners, resellers

## COURSE OBJECTIVES

You will learn the cBR-8 architecture, deployment best practices, security features and perform key DOCSIS 3.0 and 3.1 configuration tasks during hands-on labs.

## COURSE OUTLINE

Course topics include the following:

- 1. DOCSIS Primer**  
DOCSIS characteristics, available spectrum, TDM/TDMA/ATDMA/SCDMA and channel types
- 2. cBR-8 Architecture and Hardware Overview**  
Hardware overview, chassis installation, system level troubleshooting and discovery lab
- 3. Software Overview and MAC Domain Configuration**  
cBR-8 differences (versus uBR 10K), software and configuration, bringing up a MAC domain lab, 1:2 combining and 1 by 2 combining lab
- 4. Bonding and Bonding Resiliency**  
Downstream resiliency, upstream resiliency, wideband resiliency lab and battery backup
- 5. Security Features**  
Dynamic shared secret (DMIC), cable source verify, cable ARP filtering, BPI+ policy enforcement and privacy hotlist
- 6. DOCSIS Load Balancing**  
Basic DOCSIS load balancing CLI, advanced DOCSIS load balancing configuration, verification and troubleshooting, DOCSIS load balancing lab and additional load balancing features
- 7. cBR-8 Features**  
cBR-8 call home, smart licensing, high availability for supervisor and line card, cBR-8 patching - sub-package mode, cBR-8 CPU protection and punt path rate limiting (PPRL)

*(Continued)*



## **COURSE OUTLINE** *(Continued)*

### **8. DOCSIS 3.1 Architecture**

Greenfield reference architecture, physical layer properties, PHY link channel (PLC), modulation characteristics, MAC and DOCSIS upper layers, MAC protocol operation and cable modem registration (DOCSIS 3.1)

### **9. DOCSIS 3.1 Configuration**

DOCSIS 3.1 downstream, DOCSIS 3.1 downstream configuration, downstream verification, configuring DOCSIS 3.1 downstream lab, DOCSIS 3.1 upstream, DOCSIS 3.1 upstream configuration, upstream verification and configuring DOCSIS 3.1 upstream lab

### **10. cBR-8 Modem Troubleshooting**

Modem registration flowchart, cable modem MAC states, modems failing registration or BPI+, modems not coming up in wideband mode, general modem-focused troubleshooting, troubleshooting lab

The course description included in this document, including any specific content provided herein and any associated documentation provided to a client or prospective client, is confidential proprietary information of Sunset Learning Institute.





# Cisco Certified Network Associate (CCNA)

Achieving CCNA certification is the first step in preparing for a career in IT technologies. To earn CCNA certification, you pass one exam that covers a broad range of fundamentals for IT careers, based on the latest networking technologies, software development skills, and job roles.

Through NCTI and its training partner, Advanced Network Information, Inc. (ANI), students have several options to prepare for, and/or take the CCNA certification Exam.

To order any of the following products or services, please contact NCTI Customer Care. All prices are listed in US Dollars.

\*\* All prices subject to change \*\*

## Implementing and Administering Cisco Solutions

(CCNA Preparatory Course-see curriculum details below)

- » Online/Digital: \$800
- » Online/Digital with Practice Exam (five attempts): \$899
- » Individual (Combination of 5 days classroom, 3 days online): \$4,195
- » 8-Person Bundle (5 days classroom, 3 days online): Please call NCTI Customer Care for pricing
- » Custom course experience available for groups, please contact NCTI Customer Care for details

**CCNA Self-Paced Bundle** (Includes training content, practice exam, Sunset neXT Platform subscription, and Exam Voucher)

Please note: The Self-Paced Bundle is sold as a 12-month subscription and will expire 12 months from the date of purchase.

- » \$1,995
- » Without Exam Voucher: \$1,695

## OVERVIEW

The Implementing and Administering Cisco Solutions (CCNA) v1.0 course gives you a broad range of fundamental knowledge for all IT careers. Through a combination of lecture and hands-on labs, you will learn how to install, operate, configure and verify basic IPv4 and IPv6 networks. The course covers configuring network components such as switches, routers and wireless LAN controllers; managing network devices; and identifying basic security threats. The course also gives you a foundation in network programmability, automation and software-defined networking.

### **Delivery Options:**

 This class includes lecture sections and some self-study sections. In instructor-led classes, lectures are delivered in real-time, either in person or via video conferencing. In e-learning classes, the lectures are pre-recorded videos.

For classroom/online hybrid course (5 days classroom, 3 days online):

- » Please contact NCTI Customer Care for available dates, locations and times.
- » **You must provide your own laptop for both classroom and online activities.**

(Continued)

## RECOMMENDED PREREQUISITE

- » Basic computer literacy
- » Basic PC operating system navigation skills
- » Basic Internet usage skills
- » Basic IP address knowledge



**Completion Time:**

The estimated completion time for this course is eight days.

**Ideal for:**

- » headend technician
- » network engineer or administrator
  - Also appropriate for server/data center tech staff
- » NOC support specialist/technician
- » central office technician → migrating into IP-based cable support role
- » field tech for HFC plant → trying to get end-to-end understanding of cable operations

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. describe network fundamentals and build simple LANs
2. identify the components of a computer network and describe their basic characteristics
3. understand the model of host-to-host communication
4. describe the features and functions of the Cisco Internetwork Operating System (IOS®) software
5. describe LANs and the role of switches within LANs
6. describe Ethernet as the network access layer of TCP/IP and describe the operation of switches
7. install a switch and perform the initial configuration
8. describe the TCP/IP Internet layer, IPv4, its addressing scheme and subnetting
9. describe the TCP/IP Transport layer and Application layer
10. explore functions of routing
11. implement basic configuration on a Cisco router
12. explain host-to-host communications across switches and routers
13. identify and resolve common switched network issues and common problems associated with IPv4 addressing
14. describe IPv6 main features and addresses and configure and verify basic IPv6 connectivity
15. describe the operation, benefits and limitations of static routing
16. describe, implement and verify virtual local area networks (VLANs) and trunks
17. describe the application and configuration of inter-VLAN routing
18. explain the basics of dynamic routing protocols and describe components and terms of Open Shortest Path First (OSPF)
19. explain how Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP) work
20. configure link aggregation using EtherChannel
21. describe the purpose of Layer 3 redundancy protocols
22. describe basic WAN and VPN concepts
23. describe the operation of access control lists (ACLs) and their applications in the network
24. configure Internet access using Dynamic Host Configuration Protocol (DHCP) clients and explain and configure network address translation (NAT) on Cisco routers
25. describe basic quality of service (QoS) concepts
26. describe the concepts of wireless networks, which types of wireless networks can be built and how to use Wireless LAN Controllers (WLCs)
27. describe network and device architectures and introduce virtualization
28. introduce the concept of network programmability and Software-Defined Networking (SDN) and describe smart network management solutions such as Cisco DNA Center™, Software-Defined Access (SD-Access) and Software-Defined Wide Area Network (SD-WAN)
29. configure basic IOS system monitoring tools
30. describe the management of Cisco devices
31. describe the current security threat landscape
32. describe threat defense technologies
33. implement a basic security configuration of the device management plane
34. implement basic steps to harden network devices



## COURSE OUTLINE

### Lecture:

1. Exploring the functions of networking
2. Introducing the Host-to-Host Communications Model
3. Operating Cisco IOS Software
4. Introducing LANs
5. Exploring the TCP/IP Link Layer
6. Starting a Switch
7. Introducing the TCP/IP Internet Layer, IPv4 Addressing and Subnets
8. Explaining the TCP/IP Transport Layer and Application Layer
9. Exploring the Functions of Routing
10. Configuring a Cisco Router
11. Exploring the Packet Delivery Process
12. Troubleshooting a Simple Network
13. Introducing Basic IPv6
14. Configuring Static Routing
15. Implementing VLANs and Trunks
16. Routing Between VLANs
17. Introducing OSPF
18. Improving Redundant Switched Topologies with EtherChannel
19. Explaining Basics of ACL
20. Enabling Internet Connectivity
21. Explaining the Evolution of Intelligent Networks
22. Introducing System Monitoring
23. Managing Cisco Devices
24. Securing Administrative Access
25. Implementing Device Hardening

### Self-Study:

1. Building Redundant Switched Topologies
2. Exploring Layer 3 Redundancy
3. Introducing WAN Technologies
4. Introducing QoS
5. Explaining Wireless Fundamentals
6. Introducing Architectures and Virtualization
7. Examining the Security Threat Landscape
8. Implementing Threat Defense Technologies

### Lab Activities:

1. Get Started with Cisco Command-Line Interface (CLI)
2. Observe How a Switch Operates
3. Perform Basic Switch Configuration
4. Implement the Initial Switch Configuration
5. Inspect TCP/IP Applications
6. Configure an Interface on a Cisco Router
7. Configure and Verify Layer 2 Discovery Protocols
8. Implement an Initial Router Configuration
9. Configure Default Gateway

10. Explore Packet Forwarding
11. Troubleshoot Switch Media and Port Issues
12. Troubleshoot Port Duplex Issues
13. Configure Basic IPv6 Connectivity
14. Configure and Verify IPv4 Static Routes
15. Configure IPv6 Static Routes
16. Implement IPv4 Static Routing
17. Implement IPv6 Static Routing
18. Configure VLANs and Trunks
19. Troubleshoot VLANs and Trunks
20. Configure a Router on a Stick
21. Implement Multiple VLANs and Basic Routing Between the VLANs
22. Configure and Verify Single-Area OSPF
23. Configure and Verify EtherChannel
24. Improve Redundant Switched Topologies with EtherChannel
25. Configure and Verify IPv4 ACLs
26. Implement Numbered and Named IPv4 ACLs
27. Configure a Provider-Assigned IPv4 Address
28. Configure Static NAT
29. Configure Dynamic NAT and Port Address Translation (PAT)
30. Implement PAT
31. Log into the WLC
32. Monitor the WLC
33. Configure a Dynamic (VLAN) Interface
34. Configure a DHCP Scope
35. Configure a WLAN
36. Define a Remote Access Dial-In User Service (RADIUS) Server
37. Explore Management Options
38. Explore the Cisco DNA™ Center
39. Configure and Verify NTP
40. Configure System Message Logging
41. Create the Cisco IOS Image Backup
42. Upgrade Cisco IOS Image
43. Configure WLAN Using Wi-Fi Protected Access 2 (WPA2) Pre-shared Key (PSK) Using the GUI
44. Secure Console and Remote Access
45. Enable and Limit Remote Access Connectivity
46. Secure Device Administrative Access
47. Configure and Verify Port Security
48. Implement Device Hardening
49. Examining the Security Threat Landscape
50. Implementing Threat Defense Technologies



Produced in Conjunction with

**ANI**



# Cisco Prime Network Registrar

## PRICE

- » Individual: \$2,595 (prices subject to change)
- » Custom course experience available for groups, please contact NCTI Customer Care for details.

## OVERVIEW

The Cisco Prime® Network Registrar (PNR) Version 8.x/9.x instructor-led course provides you with the advanced knowledge and skill sets required to successfully deploy, maintain and troubleshoot Cisco Prime Network Registrar in a typical network environment. You will learn the fundamental concepts upon which the DHCP and DNS servers are based – this solidifies your understanding of how to troubleshoot and solve problems relating to installation and configuration. You will configure Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) servers. In addition, you will use a system command line interface (CLI) to monitor the health, status and functionality of DHCP, DNS, Trivial File Transfer Protocol (TFTP) and other servers.

- » Please contact NCTI Customer Care for available dates, locations and times.
- » **You must provide your own laptop for both classroom and online activities.**

### **Completion Time:**

- » Three days

### **Ideal for:**

This course is designed for technical professionals who need to know how to deploy, maintain and troubleshoot Cisco Prime Network Registrar in their network environments.

The primary audience for this course includes:

- » system engineers and integrators
- » technical-support personnel
- » channel partners and resellers

## COURSE OBJECTIVES

After completing this course, you will learn to deploy, maintain and troubleshoot Cisco Prime Network Registrar in a typical network environment.

You should also be able to:

1. describe the function of the regional Cisco Prime Network Registrar server and local DHCP, authoritative DNS, caching DNS and TFTP servers
2. configure DHCP servers with class-of-service options for IPv4 and IPv6
3. configure DHCP failover
4. configure PNR authoritative DNS servers
5. configure dynamic DNS and high-availability DNS pairs
6. configure PNR caching DNS servers

(Continued)

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » DOCSIS principles of operation
- » Cisco IOS Command Line Interface (CLI)





## COURSE OUTLINE

### Course Outline (22 modules)

1. Introduction to Cisco Prime Network Registrar
2. Cisco Prime Network Registrar User Interfaces
3. Regional Cluster Functions
4. Cisco Prime Network Registrar Synchronization and Replication
5. Management of Administrators, Groups and Roles
6. DHCP Protocol Review
7. DHCPv4 Configuration
8. Client Class and Client Configuration
9. DHCPv6 Configuration
10. DHCP Failover
11. DHCP Troubleshooting
12. DNS Protocol Overview
13. Authoritative DNS
14. Dynamic and High-Availability DNS
15. Cisco PNR Caching DNS
16. DHCP Expressions and Extensions
17. Address Space Management and Lease History Reporting
18. Cisco PNR Command Line Interface
19. SNMP, LDAP and TFTP Servers
20. Cisco PNR Server Database Management
21. Migration
22. Service Provider Section

### Lab Outline – Version 9.1 (14 labs)

1. Installing Cisco Prime Network Registrar on Linux
2. Navigating the Regional GUI
3. Using the Cisco Prime Network Registrar CLI
4. Configuring Cisco PNR DHCPv4
5. Configuring Client Classes and Clients
6. Configuring DHCPv6
7. Using Cisco Prime Network Registrar DHCP Server Logs
8. Configuring DHCP Failover
9. Configuring PNR Authoritative DNS
10. Configuring Dynamic DNS and High-Availability DNS
11. Installing a PNR Caching DNS Server
12. Using DHCP Extensions and Expressions
13. Cisco Prime Network Registrar Database Recovery
14. Performing Address Space Management

“The course description included in this document, including any specific content provided herein and any associated documentation provided to a client or prospective client, is confidential proprietary information of ANI.”



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# Cisco Remote PHY Deep Dive (R-PHY)

## PRICE

- » Individual: \$995
- » Custom course experience available for groups, please contact NCTI Customer Care for details.

## OVERVIEW

Remote PHY (R-PHY) is a key component in the cable industry's adoption of a Distributed Access Architecture (DAA). This Deep Dive course examines Cisco's deployment of R-PHY architecture and devices.

Remote PHY (R-PHY) is a key component in the cable industry's adoption of a Distributed Access Architecture (DAA). DAA and R-PHY are foundational technologies for future innovative network architectures such as Virtual CMTS (vCMTS), Cloud Native Broadband Router (cnBR) and Full-duplex DOCSIS. R-PHY enables the migration of physical layer (PHY) functions (such as RF Spectrum generation) from the Headend to the network edge - leading to more robust RF networks. The deployment of DAA/R-PHY, coupled with DOCSIS 3.1, allows cable operators to deliver ultra-broadband services with maximum downstream/upstream speeds approaching 10 Gbps/1 Gbps respectively.

- » Please contact NCTI Customer Care for available dates, locations and times.
- » **You must provide your own laptop for both classroom and online activities.**

### ***Completion Time:***

- » One day

### ***Ideal for:***

This course is designed for technical professionals who need to know how to deploy Cisco Remote PHY and associated equipment.

The primary audience for this course includes:

- » Cable Operator Network Operation Center personnel
- » System Engineer/ Integrator/Solutions support personnel
- » HFC Maintenance technicians
- » Channel partners, resellers

## COURSE OBJECTIVES

You will learn the Remote PHY architecture, Remote PHY Device (RPD) installation, CLI commands used for verification and monitoring, deployment best practices and perform key R-PHY configuration tasks during hands-on labs.

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » DOCSIS principles of operation
- » CMTS/CCAP platform – headend functions
- » Cisco IOS Command Line Interface (CLI)

(Continued)





## COURSE OUTLINE

Course topics include the following:

- 1. Distributed Access Architecture Concept**  
Use cases for DAA, Cisco R-PHY network components, the evolution of PHY and maintaining network 'time'
- 2. Remote PHY Architecture**  
Headend architecture, supported devices and node and shelf installation
- 3. Deployment Considerations/Options**  
DAA architecture components, CIN design and timing considerations
- 4. RPD Initialization**  
Communication protocols, initialization process, clock synchronization process and PTP clock initialization lab
- 5. R-PHY Configuration and Monitoring**  
Interface, DPIC port connectivity lab, controller profiles, RPD configuration lab, fiber node, wideband interface lab and fiber node and verification using CLI commands (CCAP and RPD)
- 6. Advanced Deployment Options**  
BEST practices and optimization, new technology/features, video and out-of-band support, implementing R-PHY video lab and smart PHY

The course description included in this document, including any specific content provided herein and any associated documentation provided to a client or prospective client, is confidential proprietary information of Sunset Learning Institute.



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# MEF-SDCP Academy

## OVERVIEW

A multi-week, blended learning program for SDCP exam preparation. The SD-WAN market is one of the hottest in the communications industry, and because of this there is a huge need for education and alignment on terminology to help increase market efficiencies. The MEF SD-WAN Standardization is the industry's first global standard defining an SD-WAN service and its service attributes to help accelerate SD-WAN market growth and facilitate creation of powerful new MEF 3.0 hybrid networking solutions for digital transformation. Getting a MEF SDCP certification comes with several benefits, and as an accredited SDCP training provider Sunset Learning can help get you there with MEF Academy and our exam pass guarantee! An exam voucher is included with the program. This program was created to combat the forgetting curve by reinforcing training in different modalities, adding additional interactive opportunities and making the learning more relevant to your business.

- » **College/campus style learning with content conveyed over a longer duration**
- » **Benefit:** Improves synthesis of the material, friendly schedule for learner and employer
- » **Peer and instructor/student interactions**
- » **Benefit:** Maintain high-value elements of a live event with breakout rooms and 1:1 sessions
- » **Content available in multiple modalities and in small chunks**
- » **Benefit:** Efficient blend of self-study and instructor-led learning styles to reinforce learning and improve ease of consumption
- » **Emphasis on exam preparation tools**
- » **Benefit:** Exam simulators and group prep sessions included to ensure learner is confident going into the exam. Each week of the 4-week program you will have the opportunity to learn and prepare for the SDCP exam through multiple modalities, as seen below. You will participate in a mix of formal, peer and experiential events, reinforcing the learning and giving you time to really comprehend the information.

### ***Delivery Options:***

 This is a virtual academy, please contact NCTI Customer Care for dates and times. You must provide your own laptop.

### ***Completion Time:***

The estimated completion time for this course is four weeks.

## BENEFITS

- » Global recognition of your vendor-neutral MEF SDWAN standards certification knowledge
- » Alignment of knowledge and competencies with MEF 3.0, as this global services framework gains momentum supported by major operators and technology providers alike
- » A community connection to the global MEF members of over 6,000 certified professionals in 85 countries

## GENERAL RECOMMENDATIONS

- » 2 years networking experience
- » a basic understanding of L2 switching, L3 routing and commonly implemented protocols (BGP, UDP, etc.)
- » potentially have a role in the deployment, design, maintenance and troubleshooting networks in a traditional WAN environment including, but not limited to: MPLS, Ethernet, mobile technologies, etc.

(Continued)





**Ideal for:**

- » sales engineers
- » network engineers
- » system engineers
- » network engineer managers
- » network consulting engineers
- » product developers
- » enterprise solution designers
- » network architects
- » product support and IT directors

## COURSE OUTLINE

### 1. Components and Features of SD-WAN

Define the fundamentals and characteristics of an SD-WAN solution according to the MEF 70 standard, demonstrate knowledge of the MEF 70 components and the functions of SD-WAN service components and service attributes

### 2. Assessing, Planning and Designing

Given a scenario, size and scale an SD-WAN solution, given a set of business requirements, assess application criticality and demand, given a scenario, recommend and justify an SD-WAN strategy based on customer strategy, given a scenario, determine integration requirements for a new SD-WAN network into an existing infrastructure and compare and contrast infrastructure and operational benefits of SD-WAN with legacy solutions

### 3. Implementation

Based on business requirements, define application flows based upon MEF 70 standard application flow criteria, based on business requirements, define and map policies based upon MEF 70 standard policy criteria, select appropriate underlay connectivity services for an SD-WAN network based on the types and characteristics of available options, given a scenario, recommend a migration strategy from existing infrastructure to new SD-WAN service, determine IP subnet and address requirements at an SD-WAN subscriber sit and determine security requirements for an SD-WAN service

### 4. Lifecycle Orchestration

Identify common service impacting issues, diagnostic toolsets and diagnostic action, based on application requirements, determine the metrics for assessing service performance and given a scenario, troubleshoot performance issues with an SD-WAN service



# MEF-SDCP SD-WAN Certified Professional

## OVERVIEW

The SD-WAN market is one of the hottest in the communications industry, with tens of billions of dollars in revenue at stake throughout the next 5 years. IDC estimates that the global SD-WAN infrastructure market (excluding managed services) will reach \$US 5.3 billion by 2023 due to strong enterprise demand and the embrace of SD-WAN by leading service providers seeking to provide enterprises with dynamic management of hybrid WAN connections with guaranteed QoS on a per-application basis.

Comprehensive SD-WAN training by MEF-Accredited Training Providers on MEF 3.0 and MEF-SDCP is an excellent career enabler for SD-WAN service providers, integrators, network consultants, technology solution providers and more.

The benefits for companies having an SD-WAN certified professionals employee pool are equally substantial: CSPs: Acquiring the depth of knowledge on the MEF SD-WAN standardization across the organization needed to develop, sell and deliver dynamic, orchestrated services enabling new customer acquisition opportunities.

- » **Enterprises:** Becoming a technically informed buyer of services, leveraging available service features, to driving network efficiencies and lower costs.
- » **Technology Suppliers, Consultants and Integrators:** Positioning your company to win SD-WAN business opportunities with certified skills and improving your marketing message.
- » **All:** The ability to recruit and retain the best and the brightest by offering the valuable, globally recognized MEF training and certifications.

### ***Delivery Options:***

 Please contact NCTI Customer Care for delivery options and/or available dates, locations and times. You must provide your own laptop.

### ***Completion Time:***

The estimated completion time for this course is three days.

## BENEFITS

- » cutting edge classroom tools for a collaborative learning experience regardless of location
- » exam pass guarantee – exam voucher is included with class!
- » pre & post-class resources provided to keep you on track and prepared for the exam

### ***Ideal for:***

- » sales engineers
- » network engineer who can demonstrate their ability to manage SD-WAN systems/operation engineers
- » system engineers (e.g., application engineers etc.)
- » network engineer managers
- » network consulting engineers

(Continued)

## GENERAL RECOMMENDATIONS

- » 2 years networking experience
- » a basic understanding of L2 switching, L3 routing and commonly implemented protocols (BGP, UDP, etc.)
- » potentially have a role in the deployment, design, maintenance and troubleshooting networks in a traditional WAN environment including, but not limited to: MPLS, Ethernet, mobile technologies, etc.





### ***Ideal for (Continued)***

- » product developers
- » enterprise solution designers
- » network architects
- » product support and IT directors

## **COURSE OBJECTIVES**

At the completion of this course, you will be prepared to pass the MEF SDCP Exam and you will possess new SDWAN knowledge that will enable you to excel in your organization. We will provide the right mix of Exam Review and an understanding of SDWAN technology topics needed for your applications. When our class is over you will be certified with the knowledge to effectively navigate SDWAN Challenges. We have taken a 'Lifecycle' approach to your learning. Our approach embraces the MEF Resources since it is what you will work with on a day-to-day basis. The course will involve activities that include the 'Self-study' MEF-SDCP SDWAN Certified Professional Exam Resources.

## **COURSE OUTLINE**

- 1. Components and Features (Exam Topic) of SD-WAN**  
Define the fundamentals and characteristics of an SD-WAN solution according to the MEF 70 standard and demonstrate knowledge of the MEF 70 components and the functions of SD-WAN service components and service attributes
- 2. Assessing, Planning and Designing (Exam Topic)**  
Given a scenario, size and scale an SD-WAN solution, given a set of business requirements, assess application criticality and demand, given a scenario, recommend and justify an SD-WAN strategy based on customer strategy, given a scenario, determine integration requirements for a new SD-WAN network into an existing infrastructure and compare and contrast infrastructure and operational benefits of SD-WAN with legacy solutions
- 4. Implementation (Exam Topic)**  
Based on business requirements, define application flows based upon MEF 70 standard application flow criteria, based on business requirements, define and map policies based upon MEF 70 standard policy criteria, select appropriate underlay connectivity services for an SD-WAN network based on the types and characteristics of available options, given a scenario, recommend a migration strategy from existing infrastructure to new SD-WAN service, determine IP subnet and address requirements at an SD-WAN subscriber sit and determine security requirements for an SD-WAN service
- 5. Lifecycle Orchestration (Exam Topic)**  
Identify common service impacting issues, diagnostic toolsets and diagnostic action, based on application requirements, determine the metrics for assessing service performance and given a scenario, troubleshoot performance issues with an SD-WAN service



# Certified Wireless Analysis Professional (CWAP)

## OVERVIEW

For those who are skilled at analyzing and troubleshooting today's wireless LANs, the Certified Wireless Analysis Professional (CWAP) certification offers an opportunity to leap forward in your career. Do you have a mastery of operation and frame exchanges? Can you perform protocol and spectrum analyses? Are MAC layer frame formats right in your wheelhouse?

Measure your skills and knowledge with this professional-level certification and get on track toward ultimately earning your Certified Wireless Network Expert (CWNE) certification. Those who pass the CWAP exam earn credit toward a CWNE certification.

### **Delivery Options:**

 Please contact NCTI Customer Care for delivery options and/or available dates, locations and times. You must provide your own laptop.

### **Completion Time:**

The estimated completion time for this course is four days.

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand the 802.11 physical (PHY) layer frame formats and technologies
2. understand the 802.11 MAC layer frame formats and technologies
3. understand the 802.11 operation and frame exchanges
4. understand advanced features of spectrum analysis
5. understand data collection methods
6. become proficient at protocol analysis and troubleshooting

## COURSE OUTLINE

### **1. Troubleshooting Processes**

Troubleshooting methodologies, CWNP methodology and troubleshooting tools

### **2. Communications**

Terminology review, beacon frames, authentication, channel access and WLAN architectures

### **3. 802.11 Frames**

Framing review, 802.11 general frame format, 802.11 frame types, important 802.11 frames, security communications and 802.11 PHY

### **4. WLAN Hardware**

Client devices, access points, WLAN controllers and managers, wireless analysis hardware and wired hardware

### **5. Protocol Analysis**

WLAN protocol analysis hardware and software, protocol analyzer common features and working with protocol analyzers

### **6. Spectrum Analysis**

Spectrum analysis hardware, terminology, spectrum analyzer features, installing and configuring and performing spectrum analysis

(Continued)

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » Certified Wireless Network Administrator





## **COURSE OUTLINE** *(Continued)*

**7. Wired Issues**

Common problems, troubleshooting tools and troubleshooting specific issues

**8. Common WLAN Issues**

Common issues, security issues, client issues, modern issues



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# Certified Wireless Design Professional (CWDP)

## OVERVIEW

For those who are skilled at analyzing and troubleshooting today's wireless LANs, the Certified Wireless Analysis Professional (CWAP) certification offers an opportunity to leap forward in your career. Do you have a mastery of operation and frame exchanges? Can you perform protocol and spectrum analyses? Are MAC layer frame formats right in your wheelhouse?

Measure your skills and knowledge with this professional-level certification and get on track toward ultimately earning your Certified Wireless Network Expert (CWNE) certification. Those who pass the CWAP exam earn credit toward a CWNE certification.

### **Delivery Options:**

 Please contact NCTI Customer Care for delivery options and/or available dates, locations and times. You must provide your own laptop.

### **Completion Time:**

The estimated completion time for this course is three days.

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand design strategies
2. describe best practices for network planning
3. explain the available technologies to satisfy 802.11n and 802.11ac design requirements
4. describe advanced site surveying
5. understand design troubleshooting methodologies

## COURSE OUTLINE

### **1. Introducing WLAN Design**

Wireless LAN (WLAN) design, importance of design and design processes

### **2. Requirements Analysis**

Understanding WLAN requirements, documentation and procedures, understanding client device population, discover planned WLAN applications, defining WLAN security requirements, physical coverage requirements for various vertical markets, outdoor WLAN bridge link requirements, existing WLAN upgrade path, WLAN test considerations and design documentation for WLANs

### **3. Site Survey Procedures**

Understanding the WLAN site survey, WLAN site survey types, spectrum analysis for WLAN site survey, WLAN site survey tools, understanding metrics and the gathered RF information, scenario-specific requirements, understanding the different site survey methodologies used and outdoor site survey procedures

### **4. Enterprise WLAN Design**

RF planning and management, interference considerations, WLAN channel planning and RF considerations, dynamic frequency selection (DFS) and transmit power control (TPC), access point selection and operation modes, antenna considerations, power over Ethernet (PoE) design concepts and WLAN security design considerations

*(Continued)*

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » Certified Wireless Network Administrator





## **COURSE OUTLINE** *(Continued)*

### **5. Advanced WLAN Design**

Branch and remote office WLAN design, WLAN design and mesh connectivity, WLAN quality of service (QoS), performance and optimization for WLANs, WLAN security considerations, WLAN deployment scenarios, identify various WLAN requirements and planning and testing tools

### **6. WLAN Deployment**

WLAN infrastructure device configuration and deployment, configuration of networking services – DHCP and DNS, autonomous, controller and cloud WLAN

### **7. Design Validation**

Post deployment survey, WLAN design validation, post deployment analysis, tools used for post deployment and post WLAN deployment troubleshooting



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# Certified Wireless Network Administrator (CWNA)

## OVERVIEW

Get a head start right out of the gate with a Certified Wireless Network Administrator (CWNA) certification. It is the base certification for Enterprise Wi-Fi within the CWNP family of certifications and a springboard toward earning your security, design, analysis and network expert certifications. Achieving it enhances your networking career profile, providing evidence that you have sought after Wi-Fi knowledge and skills.

The goal of this course is to add Wi-Fi expertise to a networking professional's skillset while covering all CWNA-108 exam topics. The course begins with discussion topics and hands-on lab exercises covering the basic operation of 802.11 Wi-Fi technology. Once a base of Wi-Fi knowledge is established, enterprise relevant topics such as Wi-Fi design, security and troubleshooting are covered. You will use enterprise-class hardware and software tools during live lab exercises, all accessible remotely for any instructor-led or virtual class.

As an added bonus, you will receive a free exam voucher.

### ***Delivery Options:***

 Please contact NCTI Customer Care for delivery options and/or available dates, locations and times. You must provide your own laptop.

### ***Completion Time:***

The estimated completion time for this course is five days.

### ***Ideal for:***

- » Administrators: network, systems, infrastructure, security and LAN/WLANs
- » Support professionals: technical assistance and field support
- » Designers: network, systems and infrastructure
- » Developers: wireless software and hardware products
- » Consultants and integrators: IT and security
- » Decision-makers: infrastructure managers, IT managers, security directors, chief security officers and chief technology officers
- » CCNA's

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. background and roles of Wi-Fi governing bodies, including the IEEE and Wi-Fi Alliance
2. radiofrequency properties and behaviors
3. wireless signal fundamentals, including measurement principles
4. antenna information, including types and installation best practices
5. Wi-Fi standards, including 802.11 extensions ac, ad, af and ah
6. Wi-Fi device types and infrastructure options
7. Wi-Fi communications processes, including connection, roaming and data transfer
8. general troubleshooting tips to common real-world 802.11n issues

(Continued)

## RECOMMENDED PREREQUISITE

The CWNA exam has no prerequisites; however, the following are recommended before attempting the CWNA exam:

- » Basic knowledge of networking (routers, switches, cabling, etc.),
- » Basic knowledge of TCP/IP
- » At least 1 year of work experience with wireless LAN technologies





## COURSE OBJECTIVES *(Continued)*

9. Wi-Fi architecture best practices, including both network and wireless design
10. similarities, differences and peculiarities about Wi-Fi deployments in differing environments (offices, K-12 education, health care facilities and more)
11. security standards, best practices, known vulnerabilities and remediation techniques for Wi-Fi networks
12. site surveying, including requirements gathering, design, installation and validation
13. troubleshooting methodology, tools and techniques, along with common issues

## COURSE OUTLINE

- 1. WLAN and Networking Industry Organizations**  
Wi-Fi related organizations, the IEEE, PHY amendments, 802.11 amendments and Wi-Fi alliance, PoE (802.3)
- 2. RF Characteristics and Behavior**  
Electromagnetic spectrum, wavelength, amplitude and other RF characteristics, reflection, refraction and other RF behavior, RF propagation and basic types of modulation
- 3. RF Mathematics and Measurements**  
RF units of measure, basic RF mathematics, RF signal measurements, understand link budgets, antennas and hardware, RF units of measure, types of antennas and antenna systems commonly used with 802.11 WLANs, antenna polarization and gain, antenna implementation, types of antenna cables, connectors and other accessories
- 4. 802.11 PHYs and Network Types**  
802.11 PHYs and network types, 802.11 frequency bands, 802.11 channels explained, OSI model layers and Wi-Fi, 802.11 physical layers (PHYs), throughput vs. data rate, RF modulation methods, 802.11 use case scenarios, WLAN operating modes including BSS, ESS and roaming
- 5. 802.11 Network Devices**  
Access point features and capabilities, AP and WLAN management systems, wireless monitoring systems (analytics), WLAN controller functionality, network architecture planes, WLAN bridging, client devices, client device OS configuration and power over Ethernet (PoE) functionality
- 6. 802.11 MAC Operations**  
802.11 frames, frame aggregation, guard interval, general frame format, PHY preamble, management, control and data frames and locating WLANs
- 7. 802.11 Channel Access Methods**  
Differences between CSMA/CD and CSMA/CA, distributed coordination function (DCF), network allocation vector (NAV), clear channel assessment (CCA), interframe spacing (IFS), contention window (CW), quality of service in 802.11 WLANs, hybrid coordination function (HCF) and additional control frames and protection modes
- 8. WLAN Network Architectures**  
Control, management and data planes, WLAN controller solutions, network architectures, RF channel planning, service set configurations and cell sizing and interference
- 9. WLAN Requirements and Solutions**  
Explore WLAN deployment scenarios, BYOD and guest access, mobile device management, radio resource management (RRM) and other automatic RF management solutions and additional management features
- 10. Security Solutions for WLANs**  
Additional authentication features, deprecated standard security, weak security mechanisms, pre-shared key and IEEE 802.1X/EAP, wireless intrusion prevention systems (WIPS), protocol and spectrum analysis for security and using secure protocols
- 11. Site Surveys, Network Design and Validation**  
Survey processes, understanding requirements, verify design requirements, documentation, locating interference, spectrum analysis, application and throughput testing and protocol analysis
- 12. WLAN Troubleshooting**  
CWNP troubleshooting methodology, protocol analysis troubleshooting features, spectrum analysis troubleshooting features, RF interference, hidden nodes and connectivity problems
- 13. Remote Lab Familiarization**  
Overview, task 1: navigate the GigaWave remote lab, task 2: navigate the interactive diagram page and task 3: closing the lab
- 14. Lab 1: Visualizing RF Principles**  
Activity objective, visual objective, required resources, task 1: prepare the client laptop in the remote lab, task 2: use Ekahau to visualize free space path loss, task 3: use Ekahau to visualize attenuation and task 4: closing the lab
- 15. Lab 2: RF Mathematics**  
Activity objective, required resources, task 1: complete these power conversions, task 2: calculate EIRP and task 3: calculate a link budget
- 16. Lab 3: Visualizing Antenna Patterns**  
Activity objective, required resources, task 1: open the FSPL file in Ekahau, task 2: use various 2.4 antenna and observe the change in RF coverage and closing the lab
- 17. Lab 4: 802.11 Basics**  
Activity objective, task 1: analyze wireless frames and task 2: closing the lab



## COURSE OUTLINE *(Continued)*

- 18. Lab 5: Initialize an Autonomous WLAN Deployment**  
Activity objective, task 1: configure an autonomous AP via CLI, task 2: configure your standalone AP from the GUI and task 3: closing the lab
- 19. Lab 6: Configure Security on Autonomous AP WLAN Deployment**  
Activity objective, task 1: configure the autonomous AP for PSK, task 2: configure Windows 7 client to connect to the Pod-X-Auto using PSK, task 3: add a local radius client to the autonomous AP, task 4: configure local RADIUS server on the autonomous AP, task 5: configure an SSID for local EAP on the autonomous AP, task 6: configure the Windows supplicant and Task 7: closing the lab
- 20. Lab 7: Configuring the WLC Central Switch WLAN Deployment**  
Activity objective, task 1: prepare the client laptop in the remote lab, task 2: review and modify management access, task 3: review AP status, task 4: configure a WLAN, task 5: associate the client, task 6: disassociate the client and task 7: closing the lab
- 21. Lab 8: Configuring Security in a Centralized WLAN Deployment**  
Activity objective, task 1: configure the data WLAN for PSK, task 2: configure the wireless client to connect to the PSK WLAN, task 3: modify the WLAN to support WPA2 with 802.1X authentication, task 4: configure the client and access the network, task 5: modify the WLAN to support WebAuth, task 6: create a local net user, task 7: connect the client to the WebAuth WLAN and task 8: closing the lab
- 22. Lab 9: Implement a WLC Local Switch WLAN Deployment Activity**  
Activity objective, task 1: configure the controller, task 2: connect to the WLAN and task 3: closing the lab
- 23. Lab 10: Configure Security on a Cloud WLAN Deployment**  
Activity objective, task 1: implement PSK authentication on a cloud WLAN deployment, task 2: implement local EAP-PEAP on a cloud WLAN deployment, task 3: implement WebAuth on a cloud WLAN deployment and task 4: disable SSIDs on the cloud WLAN deployment
- 24. Lab 11: Perform Wi-Fi Scanning**  
Activity objective, topology, task 1: enable metageek insider, task 2: review 2.4 GHz activity, task 3: review 5 GHz activity and task 4: close the lab
- 25. Lab 12: Perform a Predictive WLAN Design**  
Activity objective, task 1: familiarization with Ekahau Site Survey Pro + Planner, task 2: perform a basic predictive WLAN design using a single floor layout and task 3: closing the lab
- 26. Lab 13: Perform Passive Site Survey**  
Activity objective, task 1: configure AP for spectrum expert AP mode of operation, task 2: configure Cisco Spectrum Expert – Spectrum Analyzer Software and task 3: closing the lab



# Certified Wireless Security Professional (CWSP)

## OVERVIEW

Using the latest enterprise wireless LAN security and auditing equipment in this hands-on course, learn, in detail, the most up-to-date WLAN intrusion and DoS tools and techniques. You will learn about functionality of the 802.11i amendment to the 802.11 standard, the inner-workings of each EAP type used with wireless LANs today and every class and type of WLAN security solution available on the market from wireless intrusion prevention systems to wireless network management systems. As an added bonus, you will receive a free exam voucher.

### **Delivery Options:**

 Please contact NCTI Customer Care for delivery options and/or available dates, locations and times. You must provide your own laptop.

### **Completion Time:**

The estimated completion time for this course is four days.

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand WLAN security technology and solutions
2. describe WLAN security policy, concerns and auditing practices
3. layer vulnerabilities and analysis
4. explain WLAN mobile endpoint security solutions
5. understand WPA/WPA2 Personal and Enterprise configurations
6. describe WLAN management and monitoring
7. explain IEEE 802.11 authentication and key management (AKM)

## COURSE OUTLINE

- 1. Security Fundamentals**  
Security basics, CWNA security review, industry organizations, terminology and wireless vulnerabilities
- 2. Wireless Security Challenges**  
Network discovery, pseudo-security, legacy security mechanisms, network attacks and recommended practices
- 3. Security Policy**  
Defining security policies, policy enforcement, policy management and policy types
- 4. Understanding Authentication**  
Passphrase authentication, AAA, RBAC, RADIUS, 802.1X and EAP
- 5. Authentication and Key Management**  
Robust security networks (RSN), RSN information element, RSN authentication and key management (AKM)
- 6. Encryption**  
Encryption fundamentals, encryption algorithms, WEP, TKIP and CCMP
- 7. Security Design Scenarios**  
Virtual private networks (VPN), remote networking and guest access networks

(Continued)

## RECOMMENDED PREREQUISITE

Students should have foundational knowledge and/or experience with:

- » Certified Wireless Network Administrator (CWNA)





## **COURSE OUTLINE** *(Continued)*

### **8. Secure Roaming**

Roaming basics and terminology, preauthentication, PMK caching, opportunistic key caching (OKC), 802.11r FT, proprietary roaming and voice enterprise

### **9. Network Monitoring**

Wireless intrusion prevention systems (WIPS), WIPS deployment models, WIPS policy, threat mitigation, location services, WNMS, protocol analysis and spectrum analysis





# CUSTOMER MANAGEMENT AND SUPPORT COURSES



# NCTI'S COLLEGE CERTIFICATE AND DEGREE PROGRAM

Advance Your Career Through Professional Education



Earn college credit while learning job-specific skills through NCTI's College Certificate and Degree Program, the only distance-learning, accredited higher education program designed specifically for the broadband and cable industry. The College Certificate and Degree Program allows individuals to apply virtually all NCTI courses to college-level certificates and two-year degrees.

## CUSTOMER CARE CERTIFICATE

Individuals pursuing customer service management positions should use this option to learn the necessary verbal, written and supervisory skills needed to perform their jobs effectively. Those who earn this certificate will be uniquely qualified within the industry to manage broadband and cable customer service workgroups.

### Courses

BUS 117	Business Writing	1 credit hour
CTC 108	Cable Network Overview	1 credit hour
CTC 121	Delivering Cable Services	3 credit hours
CTC 123	Basic Broadband Troubleshooting	3 credit hours
CTC 125	High Speed Data Customer Service	2 credit hours
CTC 126	Advanced High Speed Data Customer Service	3 credit hours
MAN 212	Negotiation and Conflict Resolution	3 credit hours
MAR 111	Principles of Sales	3 credit hours
MAR 235	Consumer Behavior	3 credit hours

**TOTAL: 22 CREDIT HOURS**

\* **Note:** Students who complete this certificate may earn an Associate of Applied Science degree in Broadband Technology and Communication by completing an additional 38 specified credit hours (see next page for more information).

## GET STARTED TODAY

1. Check with your supervisor on how NCTI works with your company. Many companies cover the expense of your tuition and offer incentives and raises for graduation from a course.
2. Obtain course descriptions and a NCTI enrollment application from your supervisor, your company's NCTI training coordinator, or your human resources department.
3. You can also obtain course descriptions and a course application by clicking on the *Products* tab of our website, **www.ncti.com**, calling **866.575.7206** or emailing **info@ncti.com**.
4. Fill out the application completely, include your payment and mail to: **NCTI, 300 East Mineral Avenue, Suite 5, Littleton, CO 80122**
5. Your course will be shipped—if applicable—within 48 hours of receipt of payment.

For more information, call 866.575.7206, email [sales@ncti.com](mailto:sales@ncti.com) or visit [www.ncti.com](http://www.ncti.com)

# ASSOCIATE OF APPLIED SCIENCE IN BROADBAND TECHNOLOGY AND COMMUNICATION DEGREE FROM ACC



Through our partnership with Arapahoe Community College (ACC), regionally accredited by the North Central Association of Colleges and Schools, NCTI is pleased to provide students a straightforward path to advanced skills, opportunities for professional growth and a college degree.

The Associate of Applied Science degree allows students to complete a **NCTI Certificate of Customer Care**, combined with general education courses, major courses

and restricted electives to earn a minimum of 60 credit hours. The result is a versatile, professional degree that demonstrates both job-specific expertise and general business knowledge.

Be advised, while most courses are available anytime, others are only offered up to three times per year. Visit [www.ncti.com](http://www.ncti.com) for course availability and schedules.

## GENERAL EDUCATION REQUIREMENTS

**19 credit hours**

ENG 131	Technical Writing	3 credit hours
ENG 121	<sup>or</sup> English Composition I	3 credit hours
MAT 108	Technical Mathematics	4 credit hours
	<sup>or</sup> Higher level college math course	4 credit hours
COM 125	Interpersonal Communication	3 credit hours
CIS 118	Introduction to PC Applications	3 credit hours
BUS 115	Introduction to Business	3 credit hours
MAN 116	Effective Supervision	3 credit hours

## CORE REQUIREMENTS

**10 credit hours**

MAR 160	Excellence in Customer Service	3 credit hours
PSY 116	<sup>or</sup> Stress Management	3 credit hours
PSY 101	General Psychology I	3 credit hours
BUS 241	Cultural Diversity in Business	3 credit hours
MAN 117	Time Management	1 credit hour

**Note:** Course titles may vary at ACC.

## RESTRICTED ELECTIVES

**9 credit hours**

COM 220	Intercultural Communication	3 credit hours
MAR 111	Principles of Sales	3 credit hours
BUS 216	Business Law and the Legal Environment	3 credit hours
BUS 217	Business Communication and Report Writing	3 credit hours
MAR 216	Introduction to Marketing	3 credit hours
MAN 226	Principles of Management	3 credit hours
CTC 117	Computers and Broadband Modems	3 credit hours
CTC 118	Broadband Digital Installer	3 credit hours

## PLAN OF STUDY (SPECIALIZATION)

### CUSTOMER CARE

**22 credit hours**

BUS 117	Business Writing	1 credit hour
CTC 108	Cable Network Overview	1 credit hour
CTC 121	Delivering Cable Services	3 credit hours
CTC 123	Basic Broadband Troubleshooting	3 credit hours
CTC 125	High Speed Data Customer Service	2 credit hours
CTC 126	Advanced High Speed Data Customer Service	3 credit hours
MAN 212	Negotiation and Conflict Resolution	3 credit hours
MAR 111	Principles of Sales	3 credit hours
MAR 235	Consumer Behavior	3 credit hours

**DEGREE TOTAL: 60 CREDIT HOURS**



For more information, call 866.575.7206, email [sales@ncti.com](mailto:sales@ncti.com) or visit [www.ncti.com](http://www.ncti.com)

# Integrated Career Path for Broadband Customer Care

## NEW HIRE

## GENERALIST

## SPECIALIST

## LEAD

## MANAGER

### NCTI COURSES

- Excellence in Customer Service
- Cable Network Overview

- Delivering Cable Services
- Competitive Services

- Basic Broadband Troubleshooting
- High-Speed Data (HSD) Customer Service
- Advanced HSD Customer Service
- Principles of Sales

- Effective Supervision
- Principles of Management
- Negotiation and Conflict Resolution
- Intro to PC Applications
- Mentoring 101

- Introduction to Business
- Business Communication Skills
- Introduction to Marketing
- Stress Management

### IN HOUSE TRAINING

- MSO Specific Training

### NCTI MASTER REP CERTIFICATES

- Account Representative

- Master Account Representative
- Master Sales Representative

- Master Technical Services Representative
- Master High-Speed Data Rep

- MSO Specific Training

- MSO Specific Training

### ACADEMICS

- PROGRESSING TOWARD:**
- Customer Care College Certificate
  - Associate of Applied Science, Broadband Technology Communication Degree

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- PROGRESSING TOWARD:**
- Associate of Applied Science, Broadband Technology Communication Degree

Contact NCTI Customer Care at 866.575.7206 to map out your individual career path. You may be on your way to earning your Broadband Technology College Certificate or Associate of Applied Science, Broadband Technology Degree.



**NCTI**

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[NCTI.com](http://NCTI.com) | 866.575.7206

**amp**

**Instant Knowledge for Field Teams**

Mobile learning puts immediate, relevant and custom content directly into the hands of field teams on the device they carry with them all day.

# Integrated Career Path for Broadband Technical Support

## NEW HIRE

## TIER I

## TIER II

## LEAD

## MANAGER

### NCTI COURSES

- Excellence in Customer Service
- Cable Network Overview
- Delivering Cable Services

- Basic Broadband Troubleshooting
- High-Speed Data (HSD) Customer Service
- Consumer Digital Electronics

- Advanced HSD Customer Service
- Operations Center Technical Support (OCTS) I
- OCTS II
- OCTS III
- Understanding Voice & Data Networks
- Introduction to Networking: Home and Peer to Peer Networks
- Principles of Sales

- Effective Supervision
- Principles of Management
- Negotiation and Conflict Resolution
- Intro to PC Applications
- Mentoring 101

- Introduction to Business
- Business Communication Skills
- Introduction to Marketing
- Stress Management

### IN HOUSE TRAINING

- MSO Specific Training

### NCTI MASTER REP CERTIFICATES

- Account Representative
- Master Account Representative

- Master Technical Services Rep

- Master High-Speed Data Rep
- Operations Center Rep
- Master Network Operations Center Rep

- Customer Care College Certificate
- PROGRESSING TOWARD:**
- Associate of Applied Science, Broadband Technology Communication Degree

- OVER 50% DEGREE REQUIREMENTS COMPLETED:**
- Associate of Applied Science, Broadband Technology Communication Degree

### ACADEMICS

- PROGRESSING TOWARD:**
- Customer Care College Certificate
  - Associate of Applied Science, Broadband Technology Communication Degree

- PROGRESSING TOWARD:**
- Customer Care College Certificate
  - Associate of Applied Science, Broadband Technology Communication Degree

- PROGRESSING TOWARD:**
- Customer Care College Certificate
  - Associate of Applied Science, Broadband Technology Communication Degree

Contact NCTI Customer Care at 866.575.7206 to map out your individual career path. You may be on your way to earning your Broadband Technology College Certificate or Associate of Applied Science, Broadband Technology Degree.



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**amp**

**Instant Knowledge for Field Teams**

Mobile learning puts immediate, relevant and custom content directly into the hands of field teams on the device they carry with them all day.



# NCTI'S MASTER REPRESENTATIVE CERTIFICATION PROGRAM

The NCTI Customer Care Master Representative Certification Program recognizes broadband service representatives who have mastered the skills to be regarded as the Industry's elite. To qualify, students must successfully complete a defined set of courses related to service representative operations.

## ACCOUNT REPRESENTATIVE (AR)

This certificate confirms attainment of the customer service and sales fundamentals.

### REQUIRED COURSES:

- » Excellence in Customer Service
- » Cable Network Overview

## MASTER ACCOUNT REPRESENTATIVE (MAR)

This certificate confirms mastery of skills related to customer service, sales, and troubleshooting service-associated issues along with a deep understanding of the Industry's historical background.

### REQUIRED COURSES:

- » Account Representative Certification
- » Delivering Cable Services
- » Basic Broadband Troubleshooting

## MASTER SALES REPRESENTATIVE (MSR)

This certificate confirms the skills and techniques for selling Industry-related services.

### REQUIRED COURSES:

- » Account Representative Certification
- » Competitive Services
- » Delivering Cable Services

## MASTER TECHNICAL SERVICES REPRESENTATIVE (MTSR)

This certificate confirms the skills and knowledge to troubleshoot and help rectify broadband service delivery problems with confidence.

### REQUIRED COURSES:

- » Master Account Representative Certification
- » High-Speed Data Customer Service

## OPERATIONS CENTER REPRESENTATIVE (OCR)

This certificate confirms the ability to troubleshoot more advanced technical problems and help guide field service and maintenance technicians to resolution with speed and accuracy.

### REQUIRED COURSES:

- » Operations Center Technical Support I
- » Operations Center Technical Support II
- » Operations Center Technical Support III

## MASTER HIGH-SPEED DATA REPRESENTATIVE (MHSDR)

This certificate confirms the knowledge, skills, and support services required to install, service, and troubleshoot the high-speed data connection.

### REQUIRED COURSES:

- » Account Representative Certification
- » Delivering Cable Services
- » High-Speed Data Customer Service
- » Advanced High-speed Data Customer Service

## MASTER NETWORK OPERATIONS CENTER REPRESENTATIVE (MNOCR)

This certificate confirms the skills and abilities to sell and support virtually any facet in the broadband arena. The student possesses professionalism of the highest caliber and is recognized within the Industry as an authority in the field of broadband telecommunications.

### REQUIRED COURSES:

- » Account Representative Certification
- » Operations Center Representative Certification

Ready to achieve field success?  
Learn with NCTI:  
[ncti.com](http://ncti.com) | 866.575.7206

# NCTI Master Dispatcher

Contact NCTI to map out your career path. You may be on your way to earning a College Certificate or Degree.



**amp**

Anytime, anywhere  
access to learning  
content and  
tools

The NCTI Master Dispatcher Certification recognizes highly-skilled and trained broadband technology personnel responsible for successful deployment and daily management of service requests.

An NCTI Master Dispatcher is adept at the skills necessary for efficient technical workforce management and to support organizational initiatives to enrich the customer experience.

To be qualified as a Master Dispatcher, industry professionals must successfully complete a defined set of courses related to specific dispatch operations.



NCTI.com | 866.575.7206

## Integrated Career Path for Broadband Dispatch Operations

### NCTI MASTER DISPATCHER COURSES

- Cable Network Overview
- Excellence in Customer Service
- Delivering Cable Services
- Consumer Digital Electronics
- Basic Broadband Troubleshooting
- High-Speed Data Customer Service
- Advanced High-Speed Data Customer Service
- Operations Center Technical Support I
- Operations Center Technical Support II
- Operations Center Technical Support III
- Introduction to Networking: Home and Peer-to-Peer Networks

### IN HOUSE TRAINING

- MSO Specific Training

### NCTI MASTER REP CERTIFICATES

- Master Dispatcher
- Operations Center Representative
- PROGRESSING TOWARD:**
  - Account Representative
  - Master Account Representative
  - Master High-Speed Data Representative
  - Master Network Operations Center Representative

### ACADEMICS

- PROGRESSING TOWARD:**
  - Customer Care College Certificate
  - Associate of Applied Science, Broadband Technology Communication Degree



# How Can I Help You? Customer Service Best Practices

## OVERVIEW

This course explores best practices in providing customer service. This course can serve as an introduction if this is your first customer service job. But even if you are a seasoned professional, the scenarios and activities will give you a chance to ask yourself how you might better handle balancing the needs of your customers with the needs of your organization.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is one hour. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify customers as one of four different types: agreeable, directive, analytical, or expressive
2. adapt your customer service interaction to the customer's type
3. understand that customer service language should be both polite and efficient
4. explain how providing customer service over the phone or online differs from providing customer service in person
5. identify poor examples of customer service and explain how the agent could improve his or her interactions
6. understand how body language can affect customers' perception of the service they are receiving
7. use the "No...but" technique to emphasize what the agent can do rather than what he or she can't
8. understand the reasons that customers might be difficult and handle difficult customers professionally
9. explain why providing customer service requires great communication with co-workers and supervisor

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with





# A Manager's Guide to Superior Customer Service

## OVERVIEW

This course explores the art and science of developing a superior customer experience. Customers are vital to any organization and superior customer service can pay large financial dividends. Learners will explore the concepts of the comprehensive customer experience, as well as the benefits to the company. The course will then discuss key performance indicators, the voice of the customer, and net promoter score. The goal of this course is to help managers build an appreciation and understanding of the importance of customer loyalty and the role customer service can play.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain the concept of the comprehensive customer experience
2. discuss the case for offering superior customer service
3. describe the customer service philosophies of leading companies including Apple, Nordstrom, L.L. Bean and others
4. discuss the concept of performance measurements and Key Performance Indicators (KPIs)
5. describe the use of the Net Promoter Score (NPS)
6. discuss the Voice of the Customer (VoC) process
7. outline ways to build customer loyalty
8. explain how to calculate lifetime Customer Lifetime Value (CLV)
9. discuss the issues involved in managing customer service
10. describe how to establish customer service expectations
11. discuss the approach to providing customer service on different platforms (in-person, over the phone, online)
12. explain approaches for handling difficult customers

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with





# Excellence in Customer Service

Part of the *Customer Care Master Representative Certification Series*

## OVERVIEW

Excellence in Customer Service discusses broadband-specific topics such as account maintenance, effective communication techniques, stress management, sales processes and service level differentiation. The course also explores the history of cable TV, technology and regulatory bodies. Graduates of Excellence in Customer Service will be uniquely qualified within the cable industry to provide the highest levels of broadband-specific customer service.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 20 hours.  
The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » understand fundamental broadband troubleshooting practices
- » increase customer satisfaction levels and retention rates
- » increase customer awareness of revenue-generating services
- » better determine when a customer call requires a dispatch
- » more accurately handle customer account information and billing
- » utilize stress management techniques
- » earn three hours of college credit
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All nontechnical personnel interfacing with the customer, including:

- » customer service representatives
- » customer service supervisors and managers

## COURSE OBJECTIVES

Upon completion students will be able to:

1. explain how cable TV evolved from rural master antenna systems to high-tech broadband networks of today
2. discuss the roles of regulatory bodies including the FCC, local franchising authorities and other local, state and federal agencies as they pertain to cable TV systems
3. describe the difference between various video services provided in a cable system
4. briefly tell how video, data and voice signals are transported between the cable system headend and individual customers
5. tell how customer accounts are managed to maintain accurate customer information, including billing, services, address information and more

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Cable Network Overview
- » Delivering Cable Services
- » Basic Broadband Troubleshooting

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

6. practice effective communication skills, including listening, asking questions, overcoming objections, utilizing good telephone answering techniques and more
7. follow proper sales process to complete a sale
8. handle a cancellation request in a manner that will promote retention of the customer
9. manage stress by using effective coping skills, heeding emotional overload warning signs and practicing various relaxation techniques.
10. briefly describe a process for conducting simple technical troubleshooting to resolve a customer problem or provide valuable information for a technician to respond to a service call

## COURSE OUTLINE

### 1. Exploring the History of Broadband Cable

Understanding original signal reception quality, exploring improved signal reception quality, examining system operation development, considering service expansion, delivering “over-the-air” programming, delivering microwave programming, delivering satellite programming, learning about local government regulations, discussing state government regulations, looking at federal government regulations and discussing the Federal Communications Commission

### 2. Presenting Cable Video Services

Reviewing basic cable service, understanding expanded basic service, defining premium cable service, understanding digital and high-definition video cable services, exploring high-speed data, understanding cable telephony services and listing cable video services

### 3. Understanding How a Broadband Cable System Works

Identifying signal sources, exploring the headend, distributing broadband signals, organizing the workforce and interacting for success, defining external and internal customers and understanding customer service processes

### 4. Managing Customer Accounts and Data

Adjusting accounts, understanding damaged or lost equipment policies, dealing with non-sufficient funds (NSF) check returns, providing refunds, explaining the customer’s bill, understanding the billing process, collecting on delinquent accounts, understanding payment responsibilities, batching and posting payments, collecting cash payments, discussing cash drawer reconciliation, entering data, entering orders and looking at company reports

### 5. Communicating Effectively

Visualizing the communication model, overcoming obstacles, using strategic communication techniques, hearing vs. listening, understanding listening obstacles, listening effectively, using proper voice quality, asking effective questions, avoiding dangerous phrases, exhibiting professional courtesy and answering incoming calls

### 6. Selling Broadband Services

Knowing your service offerings, organizing a sales kit, responding honestly, following the first-person principle, matching services to the customer’s viewing interests and presenting features, benefits and value, greeting the customer, verifying information, identifying the type of call, identifying the customer’s interests, building your presentation, recommending services, maintaining the customer’s commitment, looking for buying signs, closing the sale, identifying the customer’s concerns, addressing the customer’s concerns and completing the sale

### 7. Understanding the Role of Customer Service

Reviewing the Cable and Telecommunications Association for Marketing (CTAM) report, looking at NCTA standards, defining quality customer service, serving your customer, understanding the four Cs, learning communication strategies and maintaining a professional image

### 8. Retaining Customers

Using the “stop, look, and listen” technique, understanding basic problem-resolution steps, dealing with an irate customer, handling a service cancellation request, appreciating the customer, seeking feedback and improving service

### 9. Managing Stress

Understanding stress, using effective coping skills, avoiding sabotaging behaviors, improving your resistance to stress, responding positively, relieving stress physically, assessing your stress level, heeding emotional overload warning signs, practicing various relaxation techniques, avoiding destructive style patterns, considering work-related musculoskeletal disorders (WMSDs), preventing WMSDs and using exercises to reduce the risk of WMSDs

### 10. Troubleshooting Fundamentals

Handling technical problems, defining types of video and Internet problems and understanding what to avoid when troubleshooting



# Cable Network Overview

Part of the *Customer Care Master Representative* and *Master Dispatcher Certification Series*

## OVERVIEW

Cable Network Overview introduces students to broadband cable systems, providing a general knowledge of broadband equipment, operation, terminology and competitive services. Those taking this course will gain a fundamental understanding of how broadband cable's revenue-generating operations work, without being overburdened by too much information on technology. The online course carefully explains and extensively illustrates how antennas, signal processing equipment, amplifiers and other electronic devices work in the HFC network to process, control and transport signals from the system headend to the customer premises equipment and back again.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 10 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » understand the fundamental, revenue-generating services broadband business is providing for its customers
- » more effectively function in a broadband industry environment
- » more efficiently work with technical personnel
- » compare and contrast broadband cable to its competition
- » earn one hour of college credit
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All non-technical personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel

## COURSE OBJECTIVES

Upon completing this course the student will be able to:

1. explain the major functions that occur in a headend
2. describe some of the drop system's major components and their functions
3. identify active and passive components of the HFC system
4. describe how aerial and underground networks are constructed
5. describe how radio frequency signals are combined

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Delivering Cable Services
- » Excellence in Customer Service
- » Basic Broadband Troubleshooting

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## **COURSE OBJECTIVES** *(Continued)*

6. identify test equipment used to verify proper system performance of the HFC system
7. describe actions that contribute to making customer service a priority
8. list the most common customer-provided equipment
9. understand the Digital Act of 2005

## **COURSE OUTLINE**

### **1. Broadband Cable System Overview**

Exploring the signal path, categorizing cable services and organizing departments for interaction

### **2. Understanding the Trunk System**

Introducing the trunk, identifying trunk system components, constructing the plant and maintaining the trunk

### **3. Understanding the Feeder System**

Introducing the feeder, describing feeder components and maintaining the feeder

### **4. Installing at the Drop**

Preparing a quality install, performing the aerial drop install and performing the underground drop install

### **5. Understanding Competitive Services**

Summarizing the competitive background, examining competing telecommunications services and bringing to light the value of cable



# Delivering Cable Services

Part of the *Customer Care Master Representative and Master Dispatcher Certification Series*

## OVERVIEW

Delivering Cable Services describes the delivery of video, voice and high-speed Internet services. It begins with an excellent overview of the technology of broadband cable systems, defines the terminology associated with that technology and outlines how broadband systems operate. The course takes the student through each part of the cable system and demonstrates the practices that personnel must follow to perform installations at the customer premises. Triple-play service delivery and customer equipment connections are taught in detail. Also included are lessons on system maintenance, troubleshooting, federal and local regulations and safety procedures and guidelines.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

Varies based on a student's self-study pace, however, the maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » discuss the processes and technology related to installing, operating and maintaining broadband systems
- » assist the customer in understanding how broadband technology will work in the home
- » learn how consumer electronics are connected in the premises
- » understand how federal and local regulations impact broadband technology deployment
- » earn three hours of college credit
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Personnel needing to understand how cable services are delivered to the customer, especially those handling technical issues via the phone; including:

- » customer service representatives
- » new technical support staff
- » network operations center (NOC) staff
- » sales staff
- » marketing employees

## COURSE OBJECTIVES

Upon completing this course students will understand:

1. how the broadband cable signals travel from the headend to the customer premises and from the customer premises to the headend

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Basic Broadband Troubleshooting
- » Effective Supervision

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

2. how signal modulation and processing are accomplished in the headend
3. describe video technologies, formats and services
4. how VoIP handles a phone call in a broadband cable network
5. how a cable modem and EMTA are provisioned and how they function
6. how fiber-optic equipment functions
7. procedures that technicians must use when handling fiber optic cable
8. what causes signal outages in the cable system
9. what steps are involved in routing and connecting drop cable in aerial and underground installations
10. how consumer electronics equipment is connected
11. what methods are involved in performing signal leakage monitoring
12. what personal safety practices are necessary for technical and non-technical employees

## COURSE OUTLINE

### 1. Technology Overview

Discussing broadband technology basics, introducing the electromagnetic spectrum and understanding electronics basics

### 2. Understanding Signals and the Headend

Learning about signals, discussing microwave and satellite signals and exploring the headend

### 3. Understanding Fiber Optics and HFC Networks

Introducing fiber optics, constructing fiber networks, the evolving HFC network and optimizing the HFC network

### 4. Aerial Drop Installations

Introduction to safety standards organizations, routing aerial drop cable, attaching drop cable to the strand and aerial drop attachment to the premises

### 5. Underground Drop Installations

Underground drop cable routing, how the cable is placed underground and service drop connection to the customer tap

### 6. Video Standards, Definitions and Services

Understanding television standards, identifying television formats, accessing digital television and examining digital television services

### 7. Delivering Voice

Reviewing the traditional telephone system, describing voice over Internet protocol, examining the evolution of cable telephony and explaining packet cable operations

### 8. Delivering Data

Describing cable's managed network, provisioning cable modems and activating cable modem service

### 9. Connecting Consumer Electronics

Making video connections, making audio connections and bringing consumer electronics together as a system

### 10. Understanding Network Maintenance

Introducing maintenance programs, performing routine procedures, examining signal leakage measurement equipment and understanding test equipment

### 11. Understanding Broadband Cable Regulatory Issues

Understanding government regulations, regulating network technical performance and complying with industry rules

### 12. Broadband Cable Safety and Safety Regulations

Ensuring safety on the job and understanding safety codes



# Basic Broadband Troubleshooting

Part of the *Customer Care Master Representative Certification Series*

## OVERVIEW

This course takes the knowledge gained in the Jones/NCTI course Delivering Cable Services and applies it to troubleshooting video, data, and voice services. The student will learn the cognitive elements of troubleshooting and how to bring a logic-based approach to the troubleshooting process that includes the following steps: identifying the problem, analyzing the symptoms, isolating the problem area, diagnosing the cause, resolving the problem and verifying the resolution. Additionally, the student will gain a thorough understanding of the hardware that comprises a drop system; such as coaxial cable, fiber-optic cable, and twisted-pair cable; and what can go wrong with this hardware.

### Delivery Options:

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### Completion Time:

The estimated completion time for this course is 14 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » effectively resolve technical problems with data, voice and video for the customer
- » reduce the need for expensive truck rolls by providing a convenient and immediate solution for the customer
- » apply more efficient approaches and effective techniques for phone troubleshooting
- » earn three hours of college credit
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### Ideal for:

Personnel wanting to broaden their customer service abilities to handle technical related problems via the phone including:

- » customer service and support staff
- » technical support staff

## COURSE OBJECTIVES

Upon completing this course the student will be able to:

1. outline activities to unlock creative thinking and problem solving
2. distinguish between using intuition, deductive, and inductive reasoning for problem solving
3. describe pitfalls with voice tone that prohibit clear communications
4. identify ways to overcome obstacles associated with effective listening practices
5. explain possible problems and impairments that affect coaxial cable and its connectors
6. analyze the two types of fiber-optic cable used in cable systems

(Continued)

## RECOMMENDED PREREQUISITE

- » Delivering Cable Services

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Excellence in Customer Service
- » High Speed Data Customer Service
- » Effective Supervision

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

7. examine the causes and results of fiber-optic equipment failures
8. compare the types of drop amplifiers used to increase signals in the home
9. describe the differences between a loop-through system and a home-run system
10. explain over-the-air/impulse noise ingress and its effects on digital TV signals
11. identify the possible sources and causes of ingress and egress
12. examine the use of punch-down blocks and cross connect cables for telephone and Internet connection

## COURSE OUTLINE

- 1. Thinking Skills for Troubleshooting**  
Introducing the process of troubleshooting, troubleshooting with the customer and broadband cable
- 2. Communication Skills for Troubleshooting**  
Identifying soft communication skills, understanding the importance of spoken and unspoken communications and learning how to listen
- 3. Troubleshooting Coaxial Cables and Connectors**  
Describing the drop and inside wire elements, understanding coaxial cable test equipment and explaining how to install connectors
- 4. Troubleshooting Fiber-Optic Cables and Connectors**  
Discussing characteristics of fiber-optic cable and examining how to troubleshoot problems and repair fiber-optic cable and components
- 5. Troubleshooting Drop Splitters, DC's and Drop Amps**  
Examining splitter and directional coupler problems and discussing basic troubleshooting techniques for drop amplifiers
- 6. Troubleshooting Ingress and Egress**  
Understanding ingress and egress, examining ways to isolate and diagnose the cause of ingress and examining UHF signal leakage and ingress
- 7. Troubleshooting Inside Wiring, Powering Elements and Bonding**  
Identifying insider wiring plugs and jacks, understanding how to troubleshoot inside wiring, power cables and connectors



# High-Speed Data Customer Service

Part of the *Customer Care Master Representative* and *Master Dispatcher Certification Series*

## OVERVIEW

High-Speed Data Customer Service provides an invaluable and unparalleled base of knowledge of high-speed data services, equipment, operations and troubleshooting, including extensive information regarding DOCSIS cable modems through version 3.1 and the return path's effect on high-speed data service. Personnel completing this course will be uniquely qualified to provide immediate and effective customer support for high-speed data service.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 16 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » earn two hours of college credit
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Customer contact personnel responsible for supporting cable modem customers, including:

- » high-speed data customer service representatives
- » high-speed data sales representatives
- » tier 1, 2 and 3 technical service representatives
- » administrative and marketing employees

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe how cable modem data is transported in the cable network
2. list the phases of interaction between the cable modem and the cable modem termination system during modem initialization
3. describe the steps required to certify the reliability of a customer's cable drop system
4. describe what should be checked when verifying operation of the cable modem and its computer connection
5. describe the funneling effect and the access technology used for return path transmissions

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Advanced High-Speed Data Customer Service
- » Excellence in Customer Service

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OBJECTIVES *(Continued)*

6. describe why regular maintenance is important for return path reliability
7. describe how long-loop automatic gain control adjusts the upstream carrier level of cable modems
8. describe the cause of typical return signal impairments
9. describe the information that must be gathered before troubleshooting a high-speed data problem
10. explain how the cable modem status lights are used to diagnose modem-related problems
11. explain the finer points of how the brain works during troubleshooting

## COURSE OUTLINE

### 1. Introduction to DOCSIS

Introducing cable modems, examining the different versions of Data Over Cable Service Interface Specification (DOCSIS) and considering DOCSIS in the network

### 2. DOCSIS Modem Operations

Obtaining DOCSIS single carrier radio frequency (RF) operating parameters, obtaining DOCSIS 3.1 RF operating parameters, establishing an identity in the DOCSIS network and maintaining DOCSIS modem security

### 3. Installing a DOCSIS Cable Modem

Preparing to install a cable modem, activating cable modem service and educating the customer

### 4. Return Path Operations Overview

Understanding signal flow in the return path, identifying common technical issues and maintaining the return path

### 5. Introducing Return Path Fundamentals

Describing the return path, examining how the return path works and examining the return path in the drop system

### 6. Installing the Home Media Network

Recognizing the home media network, identifying the elements of the home media network and looking at home networking technologies

### 7. Thinking Skills for Troubleshooting

Preparing your mental processes and thinking about thinking

### 8. Troubleshooting High-Speed Data Service

Delivering high-speed data service, detailing the evolution of DOCSIS and resolving problems in the customer premises



# Advanced High-Speed Data Customer Service

Part of the *Customer Care Master Representative Certification Series* and *Master Dispatcher Certification Series*

## OVERVIEW

Advanced High-Speed Data Customer Service builds upon the knowledge gained in NCTI's High-Speed Data Customer Service course. The course provides the industry's most in-depth and thorough training for customer contact personnel regarding core digital concepts and personal computers (PC). Students completing this course gain a thorough understanding of personal computers and mobile devices as well as their operating systems. The student will also learn key digital concepts and how digital relates to analog as well as insight into troubleshooting high-speed data (HSD) service.

Delivered online, the Advanced High-Speed Data Customer Service course includes videos and activities that are intended to help the student retain key points of information. The computer videos are hosted by Mike Meyers, author and holder of multiple IT industry certifications, whose colorful and humorous presentation style makes the course entertaining and effective. This course provides valuable and necessary information for anyone that provides assistance to customers that are experiencing computer related issues.

### **Delivery Options:**

 The course is delivered online with in-course activities to promote learning. Lesson and final exams are also taken online.

### **Completion Time:**

The estimated completion time for this course is 40 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » have the breadth and depth of knowledge to sell and support any high-speed data related services
- » reduce expensive truck rolls and improve customer satisfaction rates by providing advanced levels of troubleshooting on high-speed data service
- » earn three hours of college credit
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Customer service and sales representatives needing advanced training to sell or troubleshoot high-speed data services, including:

- » graduates of NCTI's High-Speed Data Customer Service course
- » tier 2 and 3 technical service representatives

## RECOMMENDED PREREQUISITE

- » High-Speed Data Customer Service

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Troubleshooting Advanced Services
- » Excellence in Customer Service
- » Effective Supervision

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Video-rich and interactive course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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(Continued)



## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. identify the main components of a computer system
2. describe how to maneuver in the different Windows operating systems to perform common tasks
3. explain the meaning of 32- and 64-bit processing
4. explain the labeling of the different types of random access memory (RAM)
5. describe the basic input/output services (BIOS) in a computer system
6. describe the computer motherboard and the different available form factors
7. describe a hard drive and solid-state drive
8. identify different types of media for storing and playing back data
9. explain how to configure common input devices in a computer system
10. understand the terms resolution, refresh rate and color depth as they relate to a computer's video configurations.
11. describe the terms Transmission Control Protocol (TCP), User Datagram Protocol (UDP) and ports in reference to Internet applications
12. describe the waveform audio file format (WAV) and musical instrument digital interface (MIDI) file formats
13. identify different laptop types and features that make laptops versatile
14. describe mobile device operating systems
15. Connect and troubleshoot devices on a wireless network
16. identify how to keep computer systems in an optimal operating condition
17. understand how digital devices are used to duplicate the physiological characteristics of the human eye and ear
18. apply the divide and conquer troubleshooting method

## COURSE OUTLINE

### 1. Operational Procedures

Discuss professionalism in appearance and communications, identify the biggest hazards to a computer, discuss safety for those working on a computer and for the computer while being worked on.

### 2. The Visible PC

Review how computers work, identify and explain the function of the main components inside a computer and describe the different computer interfaces to peripheral devices.

### 3. Visible Windows

Introduction to operating systems and touring operating systems.

### 4. Microprocessors

Understanding central processing units (CPU), investigating CPU speeds and cores, exploring CPU caches, understanding 32-bit and 64-bit processors, installing a CPU and cooling a CPU.

### 5. Random Access Memory (RAM)

Understanding RAM, looking at types of RAM, adding RAM to a system, troubleshooting RAM and understanding virtual memory.

### 6. Basic Input/Output Services (BIOS)

Defining the purpose of BIOS, describing the power-on self-test (POST) and troubleshooting BIOS.

### 7. Motherboards

Understanding form factor, ATX and ITX form factors, chipsets, the expansion bus, installing a motherboard and configuring for two CPUs.

### 8. Power Supplies

Electricity basics, describing the power supply and connections, choosing a power supply, power protection and troubleshooting the power supply.

### 9. Hard Drive Technologies

Introduction to hard drive technologies including solid-state drives.

### 10. Removable Media

Remembering floppy discs and drives, investigating optical drives and flash media.

### 11. Input Devices

Supporting common ports and connecting input devices.

### 12. Video

Investigating video displays, connectors and video settings, working with projectors, setting up multiple monitors, installing graphics cards and troubleshooting video issues.

### 13. The Internet

Understanding Internet tier structures, connecting to the Internet, investigating Internet application protocols and analyzing Internet issues.



## **COURSE OUTLINE** *(Continued)*

### **14. Multimedia**

Recognizing sound formats, working with volume and using tuners and video cards.

### **15. Wireless Networking**

Introduction to wireless networking.

### **16. Portable Computing**

Looking at laptop computers, managing and maintain portable computers and troubleshooting laptop computers.

### **17. Mobile Devices**

Comparing smart phones and tablets, describe mobile operating systems, syncing mobile devices, connecting mobile devices to a network, connecting mobile devices to email and securing mobile devices.

### **18. Securing Computers**

Exploring physical security, securing the environment against unauthorized use and against software threats, using firewalls and destroying data and complying with acceptable use policies.

### **19. Digital Basics**

Compare decimal and binary numbering, understand logic gates and integrated circuits and learn about pulse code modulation.

### **20. Troubleshooting HSD**

Modem emulators and other test equipment, house amplifiers and examining troubleshooting techniques.



# Operations Center Technical Support I

Part of the *Customer Care Master Representative Certification Series*

## OVERVIEW

This course teaches key technical skills and the knowledge required to allow network operations center personnel to quickly identify customer and network issues, isolate network difficulties and provide troubleshooting solutions. Specifically, Operations Center Technical Support I focuses on maintaining network reliability for digital video, telephony and high-speed data services. The course also provides a basic explanation of computer software and protocols, network topologies and the Open Systems Interconnection(OSI) reference model.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 22 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for SCTE's Broadband Premises Installer certification
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Network support personnel, including:

- » network dispatch technicians
- » network trouble isolation technicians
- » network operations center personnel

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain how communication signals travel over various mediums in a network
2. identify and characterize broadband cable services
3. describe the basics of digital video services
4. describe the basics of cable modems
5. explain how to effectively and efficiently troubleshoot cable services
6. convert decimal and binary numbers
7. explain the composition and basic functionality of an integrated circuit
8. examine data over cable service interface specification (DOCSIS) through version 3.1
9. describe twisted and untwisted-pair cables, connectors and their applications
10. explain voice services from traditional telephony to voice over Internet protocol (VoIP) services with PacketCable over a managed network

(Continued)

## RECOMMENDED PREREQUISITES

- » Delivering Cable Services

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Operations Center Technical Support II
- » Operations Center Technical Support III

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
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## COURSE OBJECTIVES *(Continued)*

11. characterize home media networks, including WiFi and multimedia over coax alliance (MoCA) technologies
12. identify the functions of computer hardware and software inside and outside of a network using Windows, OS X, Linux and Unix operating systems
13. describe protocols used by computers to communicate over networks

## COURSE OUTLINE

### 1. Digital Fundamentals

Looking at digital history, decimal and binary numbering systems, examining character codes, reviewing data compression, understanding logic gates, understanding integrated circuits and exploring pulse code modulation

### 2. Introduction to DOCSIS

Introducing cable modems, examining the different versions of DOCSIS and considering DOCSIS in the network

### 3. Introducing Twisted Pair Inside Wiring

Introducing the network interface device, untwisted and twisted-pair cables, twisted-pair cable hardware and twisted-pair cable routing wiring topologies

### 4. Introducing VoIP

Reviewing the traditional telephone system, describing VoIP, examining the evolution of cable telephony and explaining PacketCable operations

### 5. Troubleshooting IP Voice

Understanding how to troubleshoot IP Voice service, examining the embedded multimedia terminal adapter and diagnosing IP Voice service problems

### 6. Troubleshooting High-Speed Data Service

Delivering high-speed data service, detailing the evolution of DOCSIS and resolving problems in the customer premises

### 7. Troubleshooting Digital Video Service

Dissecting digital video troubleshooting, troubleshooting the digital set-top box, examining potential high definition multimedia interface (HDMI) problems, troubleshooting audio issues associated with digital video and attacking advanced digital video issues

### 8. Computers and Software in Networks

Devices on networks; internal computer components: central processing unit (CPU), input/output (I/O), memory and network interface card (NIC); software; and popular operating systems

### 9. Carrier Signals, Cable Types and Network Topologies

Communications and signals, network topologies, copper cable, fiber optic cable, wireless transmission and structured cable plant overview

### 10. Computer Protocols and Services

Protocols, layers of protocols and services and communicating across a network

### 11. The OSI Reference Model (OSI/RM)

Introduction to the OSI reference model, the physical layer, the data link layer, the network layer, the transport layer, the session layer, the presentation layer and the application layer



# Operations Center Technical Support II

Part of the *Customer Care Master Representative* and *Master Dispatcher Certification Series*

## OVERVIEW

Operations Center Technical Support II provides key technical skills and knowledge that allow network operations center personnel to quickly identify customer and network issues, perform troubleshooting to isolate the issue and direct the fix. This course specifically focuses on the reliability of the entire broadband network. Its coverage of electronic circuit theory provides a foundation for understanding decibels (dB), decibel millivolts (dBmV), signal leakage detection and troubleshooting techniques. The course's basic mathematics review prepares the broadband professional to tackle equations and formulas relating to basic electronic theory and signal level calculations. The course also addresses networking technologies, such as wired and wireless LAN's (local area networks), WAN's (wide area networks), as well as how antennas work. An understanding of these networking technologies is critical for network operations personnel in the networked world where we live and work. The course concludes with basic characteristics and functions of line extender amplifiers used in the distribution portion of the network.

### **Delivery Options:**

 Learning takes place online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 48 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » use this course to help prepare for SCTE's Broadband Premises Installer and Broadband Distribution Specialist certifications
- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Network support personnel, including:

- » network dispatch technicians
- » network trouble isolation technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand and apply basic DC electronic theory and discuss relevant broadband cable applications
2. perform basic mathematical calculations using equations and formulas related to installed cable systems
3. explain dB and dBmV fundamentals and their broadband cable applications, including the performance of gain and loss calculations

(Continued)

## RECOMMENDED PREREQUISITE

- » Operations Center  
Technical Support I

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Operations Center  
Technical Support III
- » Advanced High-Speed  
Data Customer Service

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
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## COURSE OBJECTIVES *(Continued)*

4. describe the operation and maintenance of signal level meters and signal leakage detection equipment
5. troubleshoot to isolate, identify and direct the repair of common problems from the customer premises and the broadband network
6. describe what a MAC (media access control) address is
7. describe common Ethernet configurations
8. explain the differences amongst the Electrical and Electronics Engineers (IEEE) 802.11 wireless LAN (local area network) standards
9. describe various aspects of WANs (wide area networks) including frame relay, ATM (asynchronous transfer mode) and VPN (virtual private network)
10. describe various spread spectrum technologies and the FCC (Federal Communications Commission) rules governing them
11. explain the equipment associated with wireless LANs
12. describe the basic attributes, purpose and functions of the general RF antenna types used in wireless networks
13. explain the theory of operation of line extender amplifiers and the function of amplifier passives and actives

## COURSE OUTLINE

### 1. Exploring Electrons and Electricity

Establishing electron characteristics, identifying element categories, understanding electron current flow, electric current and electrical force

### 2. Understanding Magnetism and Electromagnetism

Understanding magnetism and electromagnetism and exploring magnetic and electromagnetic applications

### 3. Using Positive and Negative Numbers, Decimals and Fractions

Positive and negative numbers, understanding common fractions and decimal fractions

### 4. Using Equations and Powers of Numbers

Using equations and powers of numbers

### 5. Understanding Electrical Circuits

Understanding circuit essentials and diagrams, differentiating current flow conditions and defining circuit types

### 6. Understanding Resistance

Exploring resistance, changing and controlling resistance

### 7. Using Ohm's Law for Power and Energy

Describing basic electrical characteristics, working with Ohm's law, solving power equations and other related electrical equations

### 8. DC Series Circuits

Citing basic DC circuit requirements, describing circuit characteristics and solving various circuit calculations

### 9. Understanding Decibels

Reviewing the history of decibels, making comparisons between two values, explaining the concept of bels and decibels and understanding power and voltage ratios

### 10. Using dB (decibel) and dBmV (decibel millivolt)

Working with dBmV and performing signal level calculations

### 11. Detecting Signal Leakage

Reviewing signal leakage basics and selecting and operating signal leakage measuring equipment

### 12. Introduction to Wireless LANs

The wireless LAN market and applications

### 13. Spread Spectrum Technology

Introducing spread spectrum, FHSS (frequency-hopping spread spectrum), DSSS (direct sequence spread spectrum) and comparing FHSS and DSSS

### 14. Wireless LAN Infrastructure Devices

Access points, wireless bridges, wireless workgroup bridges, wireless LAN client devices, wireless residential gateways and enterprise wireless gateways

### 15. Antennas and Accessories

RF antennas, PoE (powered Ethernet) devices and wireless LAN accessories

### 16. Extender Amplifier Operation

Examining the amplifier housing, line extender AC/DC powering systems and RF passives and controls and the amplifier module and classifying line extender specifications



# Operations Center Technical Support III

Part of the *Customer Care Master Representative* and *Master Dispatcher Certification Series*

## OVERVIEW

This course provides network operations center personnel with invaluable information on the coaxial distribution system and teaches the necessary AC (alternating current) electronic theory and application needed to perform in-depth troubleshooting of the broadband network. Network technicians will also learn the fundamentals of maintaining network reliability in the return path. The course concludes with a thorough exploration of the fiber-optic system, including optical node operations, design topologies, basic testing methods and restoration.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is 40 hours. The maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive credit toward NCTI Customer Care Master Representative certification
- » receive credit toward NCTI Master Dispatcher certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Network support personnel, including:

- » network dispatch technicians
- » network trouble isolation technicians

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe and apply AC electronic theory
2. explain the theory of passive equipment operation in the coaxial distribution system
3. describe and apply the theory of operation for power supplies and RF (radio frequency) amplifiers
4. describe the return path signal flow and major transmission elements
5. explain the concept and effects of noise funneling on the return path
6. discuss procedures for improving overall return path performance
7. explain sources of return path impairments and learn troubleshooting techniques
8. describe and apply the theory of operation for forward and return optical receivers
9. describe and apply fiber-optic topologies and design requirements
10. explain the process of fiber-optic fault location using the OTDR (optical time-domain reflectometer)
11. outline both emergency and permanent optical system restoration procedures

(Continued)

## RECOMMENDED PREREQUISITES

- » Operations Center Technical Support I
- » Operations Center Technical Support II

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Troubleshooting Advanced Services
- » High-Speed Data Customer Service
- » Effective Supervision
- » Effective Communication

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OUTLINE

- 1. Distribution System Overview**

Applying basic electronics to distribution systems, comparing distribution system architectures, examining distribution system transmission equipment, measuring system vital signs and faults and troubleshooting signal problems and outages
- 2. Alternating Current**

Understanding AC and AC power and recognizing AC waveforms
- 3. Understanding AC Waveform Fundamentals**

Examining AC waveform characteristics and expressing AC waveform values
- 4. Resistive AC Circuits**

Understanding basic relationships, eddy currents and the skin effect; solving sample problems
- 5. Inductance and Transformers**

Investigating induction, inductance, inductors and transformers
- 6. Capacitance**

Discovering capacitance and capacitors
- 7. RF Directional Couplers and Power Inserters**

Explaining directional couplers and power inserters
- 8. Working with RF Taps**

Identifying types of taps and RF tap mechanical components, examining tap electrical characteristics, understanding the theory of tap operation and considering RF tap system design criteria
- 9. Understanding Fiber Optics and HFC (Hybrid-Fiber-Coaxial) Networks**

Introducing fiber optics, constructing fiber networks, the evolving HFC network and optimizing the HFC network
- 10. Transmitting and Receiving Optical Signals**

Studying optical transmitters, understanding optical receivers and transmitting optical signals, using amplifiers, repeaters and regenerators
- 11. Understanding Fiber Optic Network Design**

Establishing network design guidelines, analyzing the network design route and discussing network documentation
- 12. Return Path Operations Overview**

Understanding signal flow in the return path, identifying common technical issues and maintaining the return path
- 13. Introducing Return Path Fundamentals**

Describing the return path, investigating how the reverse path works and examining the return path in the drop system
- 14. Troubleshooting the Return Path**

Describing return path test equipment, troubleshooting the return path in the drop system and using the spectrum analyzer to troubleshoot the HFC network
- 15. Maintaining Return Path Signals**

Describing return path amplitude levels, setting return amplifier levels and balancing the return path
- 16. Examining Signals in the Return Path**

Modulating return path signals, examining spectrum sharing technologies and analyzing return path carriers
- 17. Examining the Optical Return Path**

Introducing optical return technologies, optimizing optical return path performance and introducing optical return path multiplexing
- 18. Trunk System Overview**

Understanding system design symbols and architectures, constructing and powering the cable plant, examining transmission components, and verifying plant reliability
- 19. Presenting OTDR Basics**

Introducing OTDRs, describing OTDR types and examining OTDR features
- 20. Planning for Fiber-Optic Restorations**

Explaining a fiber restoration plan, understanding causes of optical failures and planning efficiently and effectively for fiber restorations



# Competitive Services

Part of the **Customer Care Master Representative Certification Series**

## OVERVIEW

Created specifically for the broadband industry, Competitive Services takes the broadband cable professional on a ride through the competitive landscape of the broadband industry. The regulatory issues surrounding competition are addressed for a deeper understanding of how we got to where we are. After successful course completion, the cable professional will be better equipped to communicate with the customer as well as sell their services against their competition.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » become familiar with the competitive landscape
- » be better prepared to sell cable services
- » learn about regulatory issues affecting broadband competition
- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward NCTI Customer Care Master Representative certification

### **Ideal for:**

All non-technical personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel

## COURSE OBJECTIVES

Upon completing this course, the student will be able to:

1. discuss the development of early cable systems and what led to wireless video service
2. explain the major effects of the Telecommunications Act of 1996
3. list key advanced services that came to the marketplace in the first part of the 21<sup>st</sup> century
4. explain the major effects of the Digital Transition and Public Safety Act of 2005
5. describe the competitive role of high-speed data providers
6. describe DSL television and hybrid telco technologies
7. describe the competitive role of satellite service providers
8. describe how fixed wireless networks deliver high-speed data to the customer
9. describe technologies providing both fixed and mobile broadband wireless
10. explain regulatory factors contributing to broadband cable overbuilds and user access

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Delivering Video

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## **COURSE OBJECTIVES** *(Continued)*

11. describe how broadband cable operators have improved technology to remain competitive
12. explain the benefits of Voice over Internet Protocol (VoIP) in broadband networks
13. describe how Video on Demand (VOD) services are provided to the broadband cable customer
14. describe how Digital Video Recorder (DVR) services are provided to the broadband cable customer
15. describe how gaming services are provided to the broadband cable customer

## **COURSE OUTLINE**

### **1. Summarizing the Competitive Background**

Describing early cable competition, examining the Telecommunications Act of 1996, developing advanced services and looking at the Digital Act of 2005

### **2. Examining Competing**

#### **Telecommunications Services**

Discussing telco data services, looking at Digital Subscriber Line (DSL) television and hybrid service, discussing satellite video and data services, discussing fixed wireless and fixed optical data services, defining Wi-Fi and WiMAX, redefining over-the-air broadcasting, understanding overbuilds and widening user access and observing broadband cable developments

### **3. Bringing to Light the Value of Cable**

Exploring VoIP telephony, examining interactive television history, looking at VOD and DVR service, discussing broadband gaming and looking at future trends



# Delivering Video

## OVERVIEW

Created specifically for the broadband industry, Delivering Video teaches the broadband cable customer care professional what they need to know about digital video including standards, formats and services. After successful course completion, the cable professional will be better equipped to communicate with the customer about their video services and sell these services to the customer as a result of an increased understanding of the services and the technology used to deliver them to the customer.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel
- » front counter personnel

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe the National Television System Committee's and Advanced Television Systems Committee's roles in establishing television standards
2. distinguish the characteristics of standard, enhanced and high definition television
3. describe the next-generation high definition television technologies
4. identify the different digital television signal types and how they are delivered
5. describe the digital terminal adapter and its purpose
6. explain how access to broadband cable television content is controlled
7. describe video-on-demand service
8. describe digital video recorder service
9. describe whole home entertainment
10. list the different levels of VoIP services

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Delivering Voice

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

### **1. Understanding Television Standards**

Visiting the origins of television standards, introducing the national television system committee standards, elevating television to the next step, recognizing digital television standards organizations and discussing the conversion from analog-to-digital television

### **2. Identifying Television Formats**

Describing standard definition television, recognizing enhanced definition television, defining high definition television and looking beyond high definition television

### **3. Accessing Digital Television**

Distinguishing digital television tuning, introducing the digital terminal adapter and controlling access to broadband cable television content

### **4. Examining Digital Television Services**

Defining different television services and examining the evolution of video-on-demand



# Delivering Voice

## OVERVIEW

Created specifically for the broadband industry, Delivering Voice teaches the broadband cable professional everything they need to know about digital voice, including how the broadband cable industry's PacketCable™ IP voice solution differs from traditional telephone service and from other digital voice service providers. After successful course completion, the cable professional will be better-equipped to communicate with the customer about their voice services as well as to more successfully sell the service.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel
- » front counter personnel

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe the public switched telephone network
2. describe the meaning of plain old telephone service (POTS)
3. describe how packet switching compares to circuit switching technology
4. describe the applications of the different Internet protocol (IP) networks
5. describe the benefits of the different versions of DOCSIS
6. describe the embedded multimedia terminal adapter (ETMA)
7. describe how PacketCable is different from other voice over Internet protocol (VoIP) services
8. describe how cable telephony is installed
9. list the different levels of VoIP services

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Delivering Video

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
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## COURSE OUTLINE

### **1. Reviewing the Traditional Telephone System**

Explaining the public switched telephone network and describing the traditional telephone service

### **2. Describing Voice Over Internet Protocol (VoIP)**

Introducing packet switching and defining an IP network

### **3. Examining the Evolution of Cable Telephony**

Introducing DOCSIS, introducing PacketCable, describing PacketCable telephony and exploring PacketCable VoIP architecture

### **4. Explaining PacketCable Operations**

Examining the customer VoIP interface, explaining PacketCable VoIP connections, describing PacketCable telephone calls, installing cable telephony service, explaining premises devices, calling benefits and features and defining VoIP competition



# Delivering Data

## OVERVIEW

Created specifically for the broadband industry, Delivering Data teaches broadband cable customer care professionals what they need to know about high-speed data service including how broadband cable high-speed data service differs from what is offered by other service providers. After successful course completion, the cable professional will be better equipped to communicate with the customer about their high-speed data services and to sell these services to the customer as a result of an increased understanding of these services and those of the competition.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » become educated in Data Over Cable Service Interface Specification (DOCSIS) standards, the platform by which high-speed data service is delivered to the customer
- » be better prepared to sell data services through an understanding of the service, its delivery, and the competition
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel

## COURSE OBJECTIVES

Upon completing this course, the student will be able to:

1. describe the function of each major component in a data-over-cable system
2. describe how cable modem data is transported in the cable network
3. describe how shared networks factor into delivering guaranteed data rates
4. describe the features of each DOCSIS version
5. describe the transmission control protocol/Internet protocol (TCP/IP) and simple network management protocol
6. describe how long-loop automatic gain control adjusts the upstream carrier level of cable modems
7. describe the data sent downstream from a cable modem termination system
8. describe the cable modem's upstream transmission parameters
9. describe how the cable modem acquires its IP address

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Selling Communication Services

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## **COURSE OBJECTIVES** *(Continued)*

10. identify the point at which a modem is authorized for service during initialization
11. understand how the cable modem status lights can be used to diagnose modem-related problems
12. describe some considerations for locating the cable modem in the customer premises
13. list the typical connections on a cable modem
14. identify the preferred connection between the cable modem and customer's computer
15. describe how the cable modem's identity is established
16. describe how customer privacy and security is maintained
17. describe how multiple computers can be used to operate with a single modem

## **COURSE OUTLINE**

### **1. Describing Cable's Managed Network**

Examining the architecture of a DOCSIS system, describing DOCSIS transmission, defining shared networks, examining the different versions of DOCSIS, understanding data traffic protocols and describing long-loop automatic gain control

### **2. Provisioning Cable Modems**

Synchronizing DOCSIS data, obtaining upstream parameters, describing ranging and automatic adjustments, obtaining an IP address, obtaining time and date, transferring operational parameters, registering the modem and characterizing cable modem status indicators

### **3. Activating Cable Modem Service**

Determining computer and modem location, describing the cable modem connections, connecting the cable modem to the customer's computer, activating the cable modem in the customer's home, verifying operation of the modem and computer, discussing privacy and security and discussing routers and switches



# Selling Broadband Services

## OVERVIEW

Created specifically for the broadband industry, Selling Broadband Services teaches the broadband cable professional how to systematically sell broadband services. Various selling strategies are presented, including using information kits, honesty and the “first-person principle.” A 12-step sales process is examined in detail so potential sales opportunities are not lost.

### **Delivery Options:**

 The course is delivered online. A textbook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » become proficient in a systematic sales process
- » be better prepared to sell broadband services through an understanding of the customer’s interests and their perceived value of the product
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel
- » customer facing technical staff

## COURSE OBJECTIVES

Upon completing this course, the student will be able to:

1. design and use an information kit to help sell the company’s broadband services
2. explain the importance of being honest with a customer
3. describe the “first-person principle” and how it applies to promoting broadband services
4. confidently and effectively investigate customer interests and service needs
5. discuss specific strategies for selling broadband services
6. demonstrate the steps involved in selling broadband services
7. explain how to address a customer’s concerns about purchasing broadband services
8. explain the procedures for closing the sale
9. identify steps to completing the sale

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Communication

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

### 1. Preparing a Sales Presentation

Knowing your service offerings, organizing an information kit and responding honestly

### 2. Examining Key Selling Concepts

Following the first-person principle, matching services to the customer's interests, and presenting features, benefits and value

### 3. Following the Proper Sales Process

Selling to the customer, greeting the customer, verifying information, identifying the customer's interests, building your presentation, recommending services, maintaining the customer's commitment, identifying the customer's concerns, addressing the customer's concerns, looking for buying signs, closing the sale, completing the sale and following up



# Retaining Customers

## OVERVIEW

Created specifically for the broadband industry, Retaining Customers teaches the broadband cable professional how to handle difficult situations with customers. Various advanced customer service skills are presented, including the “stop, look, and listen” technique and the acronyms PREFER and RESPECT.

### **Delivery Options:**

 The course is delivered online. An ebook is also provided. Lesson and final exams are taken online.

### **Completion Time:**

The estimated time for this course is two hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » become proficient in handling difficult situations with customers
- » be well on the way to becoming an expert in advanced customer service skills
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

All non-technical personnel interfacing with the customer including:

- » entry-level employees
- » customer service representatives
- » dispatch staff
- » sales and marketing staff
- » administrative personnel

## COURSE OBJECTIVES

Upon completing this course, the student will be able to:

1. explain the “stop, look, and listen” technique
2. describe the problem resolution steps identified in the acronym PREFER
3. describe alternative words, phrases, and behaviors to use when dealing with an irate or disappointed customer
4. explain how to focus on finding a solution to a customer’s problem
5. explain how empathy is used for managing emotions
6. relate the importance of expressing appreciation to and seeking feedback from a customer
7. help the company use customer feedback to improve service
8. explain the meaning of the acronym RESPECT

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Fundamental Selling Skills

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

### 1. Managing Customer Problems

Using the “Stop, Look and Listen” technique and understanding basic problem resolution steps

### 2. Responding to an Irate Customer

Dealing with an irate customer and handling a service cancellation request

### 3. Ensuring Customer Retention

Appreciating the customer, seeking feedback and improving service



# GENERAL EDUCATION COURSES



# NCTI'S CERTIFICATE AND DEGREE PROGRAM

Advance Your Career Through Professional Education



Earn college credit while learning job-specific skills through NCTI's College Program, the only distance-learning, accredited higher education program designed specifically for the broadband and cable industry. The College Program allows individuals to apply virtually all NCTI courses to college-level certificates and two-year degrees.

## BROADBAND LEADERSHIP CERTIFICATE

By developing the skills that prepare them to be effective leaders, students completing this certificate set themselves apart from their peers by further qualifying themselves as candidates for a promotion. With an emphasis in leadership, communication and management, graduates of this certificate will be well-suited to manage those who install, repair and service cable modems, telephony and digital video equipment as well as those who build and maintain broadband networks.

### Courses

MAN 224 Leadership	3 credit hours
COM 125 Interpersonal Communication	3 credit hours
COM 220 Intercultural Communication	3 credit hours
MAN 116 Effective Supervision	3 credit hours
MAN 226 Principles of Management	3 credit hours

**TOTAL: 15 CREDIT HOURS**

*\* Note: Students who complete this certificate may earn an Associate of Applied Science degree in Broadband Technology and Communication by completing an additional 46 specified credit hours (see next page for more information)*

## GET STARTED TODAY

1. Check with your supervisor on how NCTI works with your company. Many companies cover the expense of your tuition and offer incentives and raises for graduation from a course.
2. Obtain course descriptions and the NCTI enrollment application from your supervisor, your company's NCTI training coordinator, or your human resources department.
3. You can also obtain course descriptions and a course application by clicking on the *Curriculum* tab of our website, [www.ncti.com](http://www.ncti.com), calling **866.575.7206** or emailing [info@ncti.com](mailto:info@ncti.com).
4. Fill out the application completely, include your payment and mail to:  
**NCTI, 6855 South Havana Street, Suite 300, Centennial, CO 80112**
5. Your course materials will be shipped—if applicable—within 48 hours of receipt of payment.

For more information, call 866.575.7206, email [sales@ncti.com](mailto:sales@ncti.com) or visit [www.ncti.com](http://www.ncti.com)

# ASSOCIATE OF APPLIED SCIENCE IN BROADBAND TECHNOLOGY AND COMMUNICATION DEGREE FROM ACC



Through our partnership with Arapahoe Community College (ACC), regionally accredited by the North Central Association of Colleges and Schools, NCTI is pleased to provide students a straightforward path to advanced skills, opportunities for professional growth and a college degree.

The Associate of Applied Science degree allows students to complete the **NCTI Certificate of Broadband Leadership**, combined with general education courses, major courses

and restricted electives to earn a minimum of 60 credit hours. The result is a versatile, professional degree that demonstrates both job-specific expertise and general business knowledge.

Be advised, while most courses are available anytime, others are only offered up to three times per year. Visit [www.ncti.com](http://www.ncti.com) for course availability and schedules.

## GENERAL EDUCATION REQUIREMENTS

**19 credit hours**

ENG 131	Technical Writing	3 credit hours
ENG 121	<i>or</i> English Composition I	3 credit hours
MAT 108	Technical Mathematics	4 credit hours
	<i>or</i> Higher level college math course	4 credit hours
COM 125	Interpersonal Communication	3 credit hours
CIS 118	Introduction to PC Applications	3 credit hours
BUS 115	Introduction to Business	3 credit hours
MAN 116	Effective Supervision	3 credit hours

## CORE REQUIREMENTS

**10 credit hours**

MAR 160	Excellence in Customer Service	3 credit hours
PSY 116	<i>or</i> Stress Management	3 credit hours
PSY 101	General Psychology I	3 credit hours
BUS 241	Cultural Diversity in Business	3 credit hours
MAN 117	Time Management	1 credit hour

**Note:** Course titles may vary at ACC.

## RESTRICTED ELECTIVES

**9 credit hours**

COM 220	Intercultural Communication	3 credit hours
MAR 111	Principles of Sales	3 credit hours
BUS 217	Business Communication and Report Writing	3 credit hours
MAR 216	Introduction to Marketing	3 credit hours
MAN 226	Principles of Management	3 credit hours
CTC 117	Computers and Broadband Modems	3 credit hours
CTC 118	Broadband Digital Installer	3 credit hours

## PLAN OF STUDY (SPECIALIZATION)

### BROADBAND LEADERSHIP

**23 credit hours**

BUS 117	Business Writing	1 credit hour
COM 220	Intercultural Communication	3 credit hours
CTC 108	Cable Network Overview	1 credit hour
CTC 129	Digital Technician	3 credit hours
CTC 121	<i>or</i> Delivering Cable Services	3 credit hours
CTC 107	Installer	3 credit hours
CTC 123	<i>or</i> Basic Broadband Troubleshooting	3 credit hours
MAN 212	Negotiation and Conflict Resolution	3 credit hours
MAN 224	Leadership	3 credit hours
MAN 226	Principles of Management	3 credit hours

**DEGREE TOTAL: 61 CREDIT HOURS**



For more information, call 866.575.7206, email [sales@ncti.com](mailto:sales@ncti.com) or visit [www.ncti.com](http://www.ncti.com)

# NCTI EMERGING LEADER



**MOTIVATOR.  
VISIONARY.  
ADAPTIVE.  
COLLABORATIVE.**

An NCTI Certified Emerging Leader has mastered the critical skills necessary to be recognized as an effective mentor, manager, and leader.

To be qualified as an NCTI Emerging Leader, industry professionals must successfully complete a defined set of courses related to specific and essential leadership skills.



**NCTI.com | 866.575.7206**

## NCTI EMERGING LEADER COURSES

- **Mentoring 101**
- **Leadership 101**
- **Working Across Generations and Maximizing Diversity**
- **Maximizing Diversity with Inclusion**
- **Effective Communication**
- **Healthy Conflict Management**
- **Building Synergistic Teams**
- **Managing and Promoting Change**
- **Organizational Development, Change and Innovation**



# Hiring, Managing, and Developing Talent

## OVERVIEW

This completely online and self-paced one-module course utilizes Inc. Magazine's prize-winning editorial content to introduce basic concepts of human resources management, including recruiting; onboarding; talent development; and company culture. The focus is on providing practical, hands-on advice to entrepreneurs and small-business people, including video segments with analysis and commentary from industry-leading practitioners and subject matter experts. The course also offers real-world examples, how-to lists and advice, interactive games and review questions to ensure mastery of the material.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. decide which Human Resources functions you should outsource
2. decide what kind of help you need—employee or contractor?
3. write a job description
4. recruit job candidates online
5. set up a compensation plan aligned with your strategic goals
6. develop a system for onboarding new employees
7. decide what types of education and training will strengthen your company's performance
8. give feedback and evaluate employee performance
9. build a strong company culture
10. identify star employees with the potential for leadership
11. mentor rising star talent

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with





# Managing Remote Employees

## OVERVIEW

As businesses are increasingly turning to technology to handle both internal and external communications, the notion of a centralized workforce that meets face-to-face on a daily basis is becoming less common. Companies are embracing the idea of employing remote workers—from both near and far—who can provide a diverse range of skills and viewpoints without being bound by location. While there are many advantages to remote work for both the company and the individual, managers must be aware of the challenges that can arise when employing remote workers. This course explores the benefits and drawbacks of remote work and provides managers with tips for helping their remote workers stay connected and motivated.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify the reasons why people choose to work remotely
2. examine current attitudes toward remote work
3. consider some of the myths surrounding remote work
4. list the benefits and drawbacks of remote work arrangements
5. assess whether their company is well-suited for remote work arrangements
6. identify the top challenges when it comes to leading remote employees
7. discuss best practices for hiring and onboarding remote employees
8. explore ways to develop remote workers
9. consider how to effectively communicate with remote employees
10. develop strategies for providing feedback to remote workers
11. identify ways to motivate and connect with remote employees

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# The Effective Manager's Toolbox

## OVERVIEW

There are a number of managerial factors that are vital in managing and leading. Becoming a better manager or leader is directly connected to how well you can master them. The Effective Manager's Toolbox is a suite of online modules designed to give managers a head start on managing issues correctly and professionally with less stress and fewer negative organizational circumstances. The modules offer learners an explanation of the managerial mindset that all managers and leaders must adopt to succeed.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is 15 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. inhabit the managerial mindset
2. understand what employees want from their jobs
3. understand how managers lead
4. recognize the components of a manager's job including enforcing policies and procedures, controlling expenses, dealing with subordinates and superiors, planning and budgeting, recruiting and developing talent, and solving problems
5. implement the qualities that make an effective leader
6. address real-world managerial problems in customer service, cost budgeting, cost cutting, and vendor relations

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Effective Supervision

## OVERVIEW

Imperative for anyone with supervisory responsibilities, this course teaches how to organize and lead others competently and confidently within the broadband industry. By covering human resource challenges such as hiring needs and practices, appraisal, motivation, conflict resolution and stress management, students will learn the critical people skills necessary to function effectively in a supervisory role. Additionally, the course outlines how to develop leadership skills such as effective communication, problem solving, team building and decision making. Case studies apply these lessons to realistic situations within the broadband industry.

### **Delivery Options:**

 Learning is a combination of online and textbook activities.

### **Completion Time:**

Varies based on a student's self-study pace, however, the maximum time allowed is four months from enrollment.

## BENEFITS

Upon completion students will:

- » effectively organize, motivate and lead a department
- » efficiently communicate and delegate to establish and achieve business goals
- » understand human resource methods and resolve personnel issues
- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

- » aspiring, new and experienced supervisors
- » frontline supervisors as well as mid-level or senior managers

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. identify the functions of the management process
2. identify significant changes in the composition of the workforce and how they affect the job of the supervisor
3. describe the four ingredients of an MBO program
4. explain how a supervisor can reduce business costs
5. compare and contrast group vs. individual decision-making
6. explain why an organization is centralized or decentralized
7. identify key laws and regulations affecting human resources practices
8. identify the three most popular sets of criteria supervisors appraise for employee performance
9. identify and define five personality characteristics relevant to understanding employee performance at work
10. describe the difference between a leader and a supervisor
11. list the barriers to effective communication
12. list the five basic techniques for resolving conflict
13. list the steps a supervisor can use to change negative employee attitudes
14. describe OSHA and its impact on supervisors
15. explain job safety problems

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

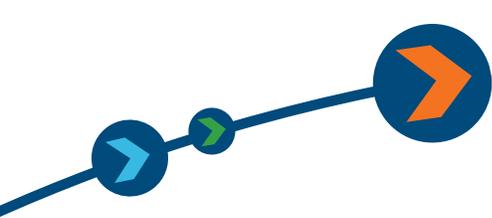
- » Introduction to Business
- » Introduction to Marketing
- » Principles of Management

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OUTLINE

### 1. Supervision Fundamentals

Organizations and their levels, the management process, changing expectations of supervisors, the transition from employee to supervisor, from concepts to skills and supervisor competencies

### 2. Supervision Challenges

Global competitiveness, technology enhancements, working in a diverse organization, changing how business operates, thriving on chaos and the good and profitable organization

### 3. Planning and Goal Setting

What is formal planning, productivity, planning and level in the organization, key planning guides and management by objectives

### 4. Organizing

What is organizing, basic organizing concepts, organizing your employees and empowering others through delegation

### 5. Staffing and Recruiting

Supervisors and the human resources department, understanding Equal Employment Opportunity (EEO), determining staffing needs, from job descriptions to job specifications, recruiting candidates, employee selection and orientation and training and development

### 6. Controlling

The control process, types of controls and the focus of control

### 7. Problem Analysis and Decision Making

The decision-making process, styles, decision tools, ethics in decision making and group decision making

### 8. Motivating Followers

What is motivation, understanding individual differences, the early theories of motivation, contemporary theories of motivation, do employees really get what they expect, motivational challenges for today's supervisors and designing motivating jobs

### 9. Leading Followers

Understanding leadership, are you born to lead, how do you become a leader, leadership behaviors and styles, effective leadership, contemporary leadership roles and leadership issues today

### 10. Communicating Effectively

What is communication, methods of communication, barriers to effective communication, active listening and the importance of feedback skills

### 11. Developing Groups

What is a group, why do people join groups, understanding informal work groups, the increasing use of teams and team challenges for supervisors

### 12. Performance Appraisal

The purpose of employee performance appraisals, when should appraisals occur, your role in performance appraisals, legal issues in performance appraisals, appraising appropriate criteria, how do you gather performance data, performance appraisal methods, potential problems in performance appraisals and responding to performance problems

### 13. Workplace Health and Safety

The occupational safety and health act, job safety programs, workplace violence, maintaining a healthy work environment, stress and helping the whole employee

### 14. Conflict, Politics, Discipline and Negotiation

What is conflict, understanding organizational politics and negotiation

### 15. Change Management

Forces for change, two views on the change process and work-related stress

### 16. Supervision and Labor

What is labor relations and a quick review of labor relations

### Postscript: Personal Development

The traditional career path, personal career development and some final words of wisdom



# Emotional Intelligence for Managers

## OVERVIEW

Emotional intelligence (EI) is our ability to identify and control our emotions to achieve positive outcomes in our relationships. Managers with high EI are better equipped to deal with subordinates, colleagues and company executives and they can do a better job of handling and resolving conflicts. This one-module course reviews the underlying concepts of emotional intelligence and explores how managers can improve and make use of their emotional intelligence.

### ***Delivery Options:***

 All learning, lesson and final exams are delivered and taken online.

### ***Completion Time:***

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. discuss the role of emotional intelligence for managers
2. explain why improving emotional intelligence can have a positive impact on managerial performance
3. recognize the importance of emotional intelligence in successful management
4. discuss the nine key EI factors
5. apply EI factors to business management scenarios

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# How to Coach

## OVERVIEW

Managers who lead and manage through coaching—providing encouragement, feedback, and support—are more successful in “working through others.” This course focuses on the skills and techniques of positive coaching in an organizational setting including listening actively, providing constructive feedback based on observation, reinforcing positive employee performance through recognition and praise, and teaching new skills.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain how coaching employees is a vital part of managing in any organization
2. distinguish between managerial coaching, executive coaching, and personal coaching
3. identify the triggers for coaching and recognize characteristics of coachability
4. describe the five-step coaching process
5. explain the SMART technique of goal setting
6. explain the USED and GROW models for coaching
7. discuss the monitoring and follow-up coaching process
8. explain the differences between mentoring and coaching

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with  
 **MINDEDGE LEARNING**

 **NCTI**  
Powers Frontline Performance



# Mentoring 101

## OVERVIEW

This course is a great beginning point for anyone who wants to establish a mentoring relationship, either as a mentor or a mentee. Students will learn how a mentoring relationship can benefit not only the mentor and mentee, but the organization as well. Understanding the mentoring process, steps on finding a mentor, building relationships, and setting goals, are only some of the topics covered in this course. This online course includes an electronic version of the *Mentoring 101 Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. This workbook supplements the online course by engaging students with the exercises that are both personal and relevant, and can be utilized immediately to guide the student in creating a mentoring relationship, or getting the most out of the mentoring relationship they currently have.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### ***Delivery Options:***

 Learning is a combination of online and workbook activities.

### ***Completion Time:***

The estimated completion time for this course is 4 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » effectively engage in the mentoring process as a mentor, a mentee, or both
- » create and implement goals by using the S.M.A.R.T. (Specific, Measurable, Achievable, Relevant, Time-bound) strategy
- » participate in active listening and asking great questions
- » embrace the 5 Critical Skills of Mentoring
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Anyone who wishes to embark in, or improve a mentoring relationship including:

- » any supervisor or manager wanting to support and enhance relationships among team members
- » employees wanting to engage in strategic goal setting and active listening

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. explain the purpose of mentoring
2. describe the benefits of mentoring at a personal and organizational level
3. state some of the positive attributes of mentors and mentees
4. explain the 6 Mentoring Relationships everyone should have
5. engage in the mentoring process
6. explain the four stages of the mentoring process
7. identify the 5 Critical Skills of Mentoring

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Leadership 101
- » Maximizing Diversity
- » Effective Communication
- » Organizational Development
- » Managing and Promoting Change
- » Healthy Conflict Management
- » Building Synergistic Teams

## TRAINING FEATURES

- » Knowledge-based, media rich and immediately applicable content
- » Highly illustrated, self-reflective exercises
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## **COURSE OBJECTIVES** *(Continued)*

8. describe behaviors you can engage in to increase your proficiency in using the 5 Critical Skills of Mentoring
9. write goals using the S.M.A.R.T. process
10. utilize each of the 5 Critical Skills within your mentoring relationship

## **COURSE OUTLINE**

### **1. Why Mentoring?**

The purpose of mentoring, the benefits of mentoring, the 6 Mentoring Relationships and personal attributes of effective mentees and mentors

### **2. The Mentoring Process and the 5 Skills of Mentoring**

The stages of the mentoring process, identifying and using the 5 Skills of Mentoring, developing S.M.A.R.T. goals, finding a mentor, the importance of active listening, how to build and bust trust, inspiring yourself and others, positive and corrective feedback



# Leadership 101

## OVERVIEW

Leadership 101's primary aim is to make leadership development relevant and practical for everyone. The lessons in this course will take you through Mentor Leadership Team's leadership model, the Leadership Essentials, to give you the framework, skills and knowledge to take your leadership to the next level. The Leadership Essentials begin with Authentic Leadership as the foundational component to effective leadership and then moves through the 4 E's of the Leadership Essentials to give you the skills you need leverage your strengths and the strengths of others to maximize your collective impact. This online course includes an electronic version of the *Leadership 101 Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook supplements the online course by engaging students in exercises that are both personal and relevant and can be utilized immediately to guide the student in the quest to improve their leadership expertise.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### **Delivery Options:**

 Learning is a combination of online and workbook activities.

### **Completion Time:**

The estimated completion time for this course is 14 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » discover the meaning of authentic leadership
- » embrace the 4 essential aspects of leadership
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Anyone who wishes to improve leadership skills such as supervisors, managers, and employees desiring to be supervisors and managers

## COURSE OBJECTIVES

Upon completing this course students will be able to:

1. Identify the difference between personality, traits, experiences, and skills.
2. Describe your current leadership weaknesses and list practical ways to better manage your "shadow side" tendencies.
3. Overcome the four common obstacles that leaders face.
4. Grasp the ten core characteristics of an authentic leader.
5. Explain the differences between a manager and a leader.
6. Define Transformational Leadership.
7. Incorporate the six behaviors of leaders who engage.
8. Employ effective ways to increase your credibility and encourage truth telling.
9. Learn ways you can communicate your team's values and vision to promote unity
10. Craft a corporate narrative that inspires people to join a cause bigger than themselves
11. Describe each of the four steps for enlisting people in a common cause.

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Maximizing Diversity
- » Effective Communication
- » Organizational Development
- » Managing and Promoting Change
- » Healthy Conflict Management
- » Building Synergistic Teams

## TRAINING FEATURES

- » Knowledge-based, media rich and immediately applicable content
- » Highly illustrated, self-reflective exercises
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**
- » Webinar available upon request

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OBJECTIVES *(Continued)*

12. Understand the power and impact of collaboration and apply practical steps for increasing collaboration in your workplace.
13. Define “empower” and describe why empowering others is necessary for leadership.
14. Circumvent the common barriers to empowering others.

## COURSE OUTLINE

### 1. Authentic Leadership I

Authentic leadership, the three A’s of authentic leadership, know yourself, recognize your shadow side and manage your shadow side

### 2. Authentic Leadership II

Authentic leadership overview, accentuate your uniqueness, clarify your core values, align: determine your passions and desired contributions, activate: define your purpose, focus on self-discipline

### 3. Introduction to the Leadership Essentials

Leaders vs. managers, transformational leadership and introducing the 4 essentials of leadership

### 4. The Leadership Essentials: Engage

Overview of engage, the basics of engaging, know your followers and connect with them, manage and respond to emotions appropriately, grow in self-awareness and self-management and encourage truth telling

### 5. The Leadership Essentials: Enlist

The 4 E’s of the leadership essentials: enlist, the power of a common cause, clarify your vision, believe in your vision, communicate your vision and preserve your vision

### 6. The Leadership Essentials: Equip

The 4 E’s of the leadership essentials: equip, situational leadership, four ways to equip your followers, increase competence, remove obstacles, create opportunities, stretch their reach and create a learning culture built on collaboration

### 7. The Leadership Essentials: Empower

The 4 E’s of the leadership essentials: empower, empowering others, managing your power and influence, motivate, be a multiplier not a diminisher, manage performance and collaborate and celebrate wins



# HR Ethics Series: Ethical Decision Making

## OVERVIEW

Business leaders, managers, and staff at all levels of an organization will face decisions in their pursuit of moving the business forward—however, some decisions may be easier to navigate than others. When faced with a situation where no clear answer rings out, how do you decide on the best course of action? This course introduces learners to the principles and processes involved in making ethical decisions—that is, making decisions that are based on close examination of different ethical frameworks, the notion of right and wrong, and moral standards. This course pays special attention to situations within the realm of human resources, where upholding an ethical approach to decision making is crucial.

### ***Delivery Options:***

 All learning, lesson and final exams are delivered and taken online.

### ***Completion Time:***

The estimated completion time for this course is one and a half hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. discuss the process of making moral decisions
2. compare moral versus nonmoral standards
3. define and construct strong moral arguments
4. describe various models for ethical decision making
5. identify the fundamental ethical principles that guide our decision making
6. consider the origins of our moral principles
7. discuss the concepts of groupthink and diffusion of responsibility
8. apply ethical principles to employee relations scenarios

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Working Across Generations and Maximizing Diversity

## OVERVIEW

Maximizing diversity means appreciating and using the differences of others to create synergies that enable you to work at a level of productivity that you could not possibly achieve alone. In this course you will learn about different types of diversity and the strategies you can implement to promote understanding and respect for others in order to take full advantage of the power that comes from working with those who are different from you. This online course includes a *Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook is available as an online PDF document. It supplements the online course by engaging students with the exercises that are both personal and relevant, and can be utilized immediately to guide the student in the quest to improve their expertise in diversity.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### **Delivery Options:**

 Learning is a combination of online and workbook activities.

### **Completion Time:**

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » discover the meaning of generational diversity
- » learn how to reap the benefits of diversity in the workplace
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Anyone who wishes to improve their awareness of diversity skills, such as supervisors, managers and employees desiring professional growth and development

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. list and explain the “3 G’s” to consider when appreciating diversity
2. list the positive attributes of each of the different generations in the workplace and describe ways these attributes provide valuable perspective
3. understand the cultural continuums and assess where those you work with operate along those continuums
4. describe the positive attributes of men and women and give examples of how those attributes can complement each other by working together
5. understand and apply the skills for bridging cultural differences

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Communication
- » Organizational Development
- » Managing and Promoting Change
- » Healthy Conflict Management
- » Building Synergistic Teams

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OUTLINE

### 1. Working Across Differences

Looking at others, working with people who are different than you, traditional ways of training and the three G's of diversity

### 2. Generational Distinctions

Four generations: characteristics of traditionalists, baby boomers, generation X and millennials (generation Y); statistics about generational distinctions, comparison of stereotypes vs. positive attributes, things you appreciate about different generations, promoting understanding and appreciation of other generations

### 3. Global and Cultural Diversity

Nuances of behavior, cultural continuums, how multicultural experiences affect views on differences and appreciating other cultures

### 4. Gender Differences

Gender perspectives and executive teams, personal impact of gender differences and how to appreciate gender differences in your organization

### 5. How to FACE the Issue

Frustration, appreciation, collaboration, empowerment and observing generational, global and gender differences



# Maximizing Diversity with Inclusion: Benefits, Best Practices and Compliance

Part of the *Emerging Leader Certification Series*

## OVERVIEW

Maximizing Diversity with Inclusion: Benefits, Best Practices and Compliance: Welcoming diversity and supporting inclusion addresses our shared need to feel we are respected and appreciated in the workplace. While supporting diverse and inclusive organizational culture is important for compliance, it has become a significant business strategy. A clear understanding of diversity and inclusion creates and sustains growth, and fosters a more creative, respectful and productive workplace. In this course, you will learn about the importance of diversity, strategies you can implement to promote inclusion and the nuts and bolts of compliance to an equal opportunity and harassment free workplace.

### **Delivery Options:**

 This course is delivered online. Lesson and final exams are taken online.

### **Completion Time:**

The estimated completion time for this course is four hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive an industry-recognized NCTI certificate of graduation
- » receive credit toward the NCTI Emerging Leader certification

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. articulate why diversity matters and identify practical ways you can promote diversity in your workplace
2. articulate the advantages to inclusion and practical ways to promote inclusion in your company
3. understand why compliance is important and what behaviors are acceptable and which ones you need to avoid

## COURSE OUTLINE

### **1. Diversity**

Benefits of diverse workplaces, building diversity throughout an organization, appreciating diversity, diversity of thought, traditional diversity programs, gender generational and global differences

### **2. Inclusion for Organizational Effectiveness**

The cost of hostile work environments, belonging, growth, types of bias, making the unconscious conscious and tolerance versus inclusion

### **3. Compliance**

Ensuring equal opportunity, discrimination-free, how does your company stack up, the spotlight of potential harassment, sexual harassment, bullying, mentoring and promoting a healthy culture

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Communication
- » Organizational Development
- » Managing and Promoting Change
- » Healthy Conflict Management
- » Building Synergistic Teams

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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# Effective Communication

## OVERVIEW

We communicate to get our point across. But strong leaders understand that effective communication should also affirm and empower the person or persons you are communicating with. This course will help you maximize your influence to work with the people around you by giving you the knowledge and skills to effectively communicate as a leader and person of influence. This online course includes an electronic version of the *Leadership 101 Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook is available as an online PDF document. It supplements the online course by engaging students with the exercises that are both personal and relevant, and can be utilized immediately to guide the student in their quest to communicate effectively.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### ***Delivery Options:***

 Learning is a combination of online and workbook activities.

### ***Completion Time:***

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » be equipped with communication skills that can be practiced in all facets of one's life
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Anyone who wishes to improve their ability to communicate more effectively, such as supervisors, managers and employees desiring professional growth and development

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain what makes communication effective
2. explain why listening is important and what skills are needed
3. understand the other musts in effective communication
4. articulate the barriers to valuable communication

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Building Synergistic Teams
- » Organizational Development
- » Maximizing Diversity
- » Managing and Promoting Change
- » Healthy Conflict Management

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
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(Continued)





## COURSE OUTLINE

### 1. **The Importance of Effective Communication**

Communicating accurately and what makes an effective communicator

### 2. **Skillful Listening**

The most effective style of listening, how you listen, five listening styles and selfless active listening

### 3. **Helpful Listening Techniques and Tools**

Two techniques for better active listening, quiet your inside, five types of questions and why to avoid leading questions

### 4. **Make Communication Effective**

Developing nonverbal communication, body language, guidelines for making communication effective, examples of poor communication and storytelling

### 5. **Communication Issues**

Written communication, oral communication types and problems and types of persuasive communication



# Handling Difficult Conversations in the Workplace

## OVERVIEW

If you're a manager or supervisor, you have probably been faced with a difficult conversation with a direct report. Not only do these conversations require sensitivity, delicacy, and in all likelihood, confidentiality, but how the conversation is handled can greatly impact the outcome. This course seeks to prepare learners to better handle awkward and difficult discussions with employees. Many difficult conversations can impact employee productivity, but as the manager or supervisor, you can learn to coach and counsel employees to create a calmer work environment and increase staff retention and productivity in the process.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. describe a six-step model for handling difficult conversations with employees
2. address 10 common difficult discussions
3. apply practical tips for handling conversations about difficult behaviors
4. outline best practices for handling difficult conversations
5. apply best practices to workplace scenarios involving difficult conversations

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with





# Healthy Conflict Management

## OVERVIEW

Conflict is a natural result of people working together. When it is handled in an unhealthy manner, productivity declines. When healthy conflict is encouraged and regarded as a necessary ingredient for growth, productivity and morale soar. The purpose of this course is to give you the knowledge you need to resolve unhealthy conflict and to help you promote healthy conflict you can use to increase your organizational impact. This online course includes a *Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook is available as an online PDF document. It supplements the online course by engaging students with the exercises that are both personal and relevant, and can be utilized immediately to guide the student in the quest to improve their ability to deal with conflict.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### ***Delivery Options:***

 Learning is a combination of online and workbook activities.

### ***Completion Time:***

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » know how to manage conflict in a healthy way
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Anyone who wishes to improve their ability to use conflict to their advantage, such as supervisors, managers and employees desiring professional growth and development

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain why conflict is so important in leadership
2. identify characteristics of healthy and unhealthy conflict
3. explain the actions for proactively promoting healthy conflict with your team members
4. know what to do when conflict surfaces

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Communication
- » Organizational Development
- » Maximizing Diversity
- » Managing and Promoting Change
- » Building Synergistic Teams

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.



(Continued)



## COURSE OUTLINE

### 1. **Healthy and Unhealthy Conflict**

Healthy conflict, discipline and accountability, conflict styles, collaborative style and reaction to conflict

### 2. **Proactively Promoting Healthy Conflict**

Establish expectations, show your teammates that you believe in them, create a learning culture and remain open to other perspectives, act quickly and model healthy behavior and energize and connect people through a compelling vision

### 3. **Resolving Conflict**

Identifying personal “hot buttons”, interpersonal differences, respect and calmer thinking

### 4. **Crucial Conversations**

The three stages of a crucial conversation, “work on me first”, confront with safety and move to action

### 5. **The Essential Ingredient to Good Conflict Management**

Role vs. identity, past reactions to conflict or corrective feedback, skills to managing your reactions, keep confidants and seek sanctuary



# Introduction to Critical Thinking

## OVERVIEW

Critical thinking is an intellectual model for reasoning through issues to reach well-founded conclusions. It may be the single-most valuable skill that one can bring to any job, profession, or life challenge. Being able to ask the right questions, critique an argument, and logically dissect an issue occur constantly in the workplace and our lives. This introductory-level course is designed to help learners define and identify critical thinking and reasoning skills and develop those skills.

### ***Delivery Options:***

 All learning, lesson and final exams are delivered and taken online.

### ***Completion Time:***

The estimated completion time for this course is seven hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. define critical thinking, reasoning, and logic
2. ask appropriate questions for critical thinking
3. understand the process of systemic problem-solving
4. identify and overcome barriers to critical thinking
5. articulate common reasoning fallacies
6. understand critical thinking as it pertains to the workplace

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Building Synergistic Teams

## OVERVIEW

In order to navigate the growing complexity of work that requires cross-discipline collaboration between highly diverse individuals, we must understand how to build strong teams. Healthy teams are essential to success. As a person of influence, you play an important role in enabling teams to reach their full potential. This course will help you understand how to encourage synergies among team members that will supercharge your individual and collective efforts. This online course includes a Learner Workbook, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook is available as an online pdf document. It supplements the online course by engaging students with exercises that are both personal and relevant and can be utilized immediately to guide the student in the quest to improve their ability to build truly functional teams.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### ***Delivery Options:***

 Learning is a combination of online and workbook activities.

### ***Completion Time:***

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » know how to intentionally build a team
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Anyone who wishes to improve their team building skills such as supervisors, managers and employees desiring professional growth and development

## COURSE OBJECTIVES

Upon completing this course, the student will be able to:

1. put intentional team building into practice
2. give practical actions to take within each step to build a cohesive and productive team
3. identify team dysfunction and list ways to correct it
4. understand the power of diversity and collaboration

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Communication
- » Organizational Development
- » Maximizing Diversity
- » Managing and Promoting Change
- » Healthy Conflict Management

## TRAINING FEATURES

- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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**1. The Power of Synergistic Teams**

Defining synergy, champion teams and motivation to build synergistic teams

**2. Intentional Team Building, Part 1**

Team life cycle, stages of team building, stages of team formation, mission to motivation, common values to championing, commitment to contract and intentional team building

**3. Intentional Team Building, Part 2**

Awareness to appreciation, appreciation of team members, time together to trust, communication to conflict management, curtailing gossip and processes for intentional team building

**4. Team Dysfunction**

The five dysfunctions of a team, solutions to team dysfunction and recognizing and addressing team dysfunctions

**5. Diverse Teams**

Statistics about diverse teams, recognizing strengths of diverse team members and difficulty with others in diverse teams

**6. Collaboration**

Benefits and barriers of collaboration, being part of the solution and putting ideas into action



# Managing and Promoting Change

## OVERVIEW

Change is a springboard for creativity because it requires us to come up with new and exciting solutions. Practically speaking, change can be hard to deal with. As a leader, it is essential that you understand how to manage change as well as effectively lead others through the change process. The purpose of this course is to give you the practical know-how to manage change effectively as well as promote change for greater creativity and productivity. This online course includes a *Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook is available as an online PDF document. It supplements the online course by engaging students with exercises that are both personal and relevant, and can be utilized immediately to guide the student in the quest to improve their ability to change.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### ***Delivery Options:***

 Learning is a combination of online and workbook activities.

### ***Completion Time:***

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » be better able to not just manage but actually promote change
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Anyone who wishes to improve their ability to embrace change, such as supervisors, managers and employees desiring professional growth and development

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain why change is important to all leaders
2. appreciate the change process and its powerful effects
3. work out the aspects of promoting personal change
4. describe ways you can advance change by helping others manage change well

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Communication
- » Organizational Development
- » Maximizing Diversity
- » Healthy Conflict Management
- » Building Synergistic Teams

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.



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## COURSE OUTLINE

### 1. Change Happens

Resistance to change, four primary issues, control, communication, announcement of change, personality, and your reaction to change, identifying change personalities, customizing your actions, leadership and struggles with changes

### 2. The Issue of Managing Change

The change hinge, healthy change management, the phases of change, identifying benefits, understanding change, process of change hinge, phase one—loss, phase two—uncertainty, the critical hinge choice, phase three—anticipation and phase four—integration

### 3. Promoting Personal Change

List of challenges in change, identifying wanted personal changes, write goals using the smart method, integrate your goals, make your goals positive, identifying effective goal statements, make your goal visual, make your goals challenging, share, repeat and make goals flexible



# Organizational Development, Change and Innovation

## OVERVIEW

This course takes a look at change and innovation from an organizational perspective. What can organizations—and the people within them—do to help build a culture that embraces change, promotes innovation and encourages every individual to own their part in developing their organization to rise above the rest? In this course you are given practical tools and best practices you can use to manage change and encourage innovation. This online course includes a *Learner Workbook*, which contains thought provoking exercises that are an integral part of successfully completing the course. The workbook is available as an online PDF document. It supplements the online course by engaging students with exercises that are both personal and relevant, and can be utilized immediately to guide the student in their quest to thrive in an organization.

**To nurture communication of ideas and opinions across teams, an optional group discussion guide is provided.**

### ***Delivery Options:***

 Learning is a combination of online and workbook activities.

### ***Completion Time:***

The estimated completion time for this course is 2 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » utilize practical tools and best practices to manage change and encourage innovation
- » receive credit toward the NCTI Emerging Leader certification
- » receive an industry-recognized NCTI certificate of graduation

### ***Ideal for:***

Anyone who wishes to improve their ability to reap the benefits of change and innovation in an organizational setting, such as supervisors, managers and employees desiring professional growth and development

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand the perception shifts related to change, organizational structure, leadership and communication
2. describe the steps needed in organizational change
3. understand innovation best practices

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Building Synergistic Teams
- » Effective Communication
- » Maximizing Diversity
- » Managing and Promoting Change
- » Healthy Conflict Management

## TRAINING FEATURES

- » Highly illustrated and easy-to-read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

### 1. What is Organizational Development

Changing business landscape, objectives of organizational development, small, big and incremental changes and big ideas

### 2. Perception Shifts

Old vs. new perceptions and assessing my organization

### 3. Guidelines for Organizational Change

Guiding principles of organizational change, know your direction and leverage your people as internal change agents

### 4. Innovation

Things that hinder innovation, how to innovate, ask questions, brainstorm to seek the unique, tips for increasing observation skills, capture every idea, test and experiment, fear of failure and solutions to innovation killers



# Excel Basics

## OVERVIEW

As big data continues to change the way businesses operate and drive strategy, the ability to efficiently and effectively organize and analyze data is crucial. Managers need to be able to utilize tools to identify trends and help make better business decisions. Microsoft's Excel is a powerful spreadsheet software to organize and manage data related to business operations. This course focuses on mastering the fundamental tasks performed in Excel, including data entry, basic formula calculations, and formatting and style operations. During the course, you will learn how to build a spreadsheet from scratch and gain a greater understanding of the most popular Excel commands and functions.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify and understand the different components of the Excel interface
2. enter and convert numerical and text data, dates, and times
3. select, copy, and paste data in a workbook
4. employ elements of style to the workbook
5. create images, illustrations, shapes, and hyperlinks in a worksheet
6. arrange, filter, and sort lists of data
7. apply basic formatting elements to the worksheet
8. formulate basic mathematical formulas and functions, including SUM, AVERAGE, and MAX and MIN VALUE
9. reorganize data by removing duplicates, blanks spaces, and misspellings in a worksheet
10. open, save, and protect the workbook

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Excel Advanced Skills

## OVERVIEW

This course is designed for the learner who already has a solid understanding of Excel's basic tools and functions. The course teaches learners some of the more advanced skills and features available in Excel, which may be useful in data analysis. These skills include style templates, conditional formatting, data validation, data manipulation, and pivot tables.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. employ built-in cell style templates, or produce a custom one, to streamline the data entry process
2. create a drop-down list to restrict data entry values
3. utilize the Conditional formatting feature to apply formats to a cell or a range of cells based on specific criteria
4. organize worksheet data using the Group Function
5. use the Consolidation Function to combine data from several worksheets into one
6. differentiate between and discern when to use a relative or an absolute reference in a formula
7. change the orientation of an array of data using the Transpose function
8. use the Advanced filter Extract data from a data set based on complex criteria using the Advanced Filter tool
9. analyze data using Pivot Tables
10. calculate data across several worksheets with the same structure using a 3D reference
11. perform partial searches when filtering or analyzing data using wildcard characters

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Understanding and Managing Budgets

## OVERVIEW

A budget is a detail of expenses and incomes for a set period of time. This introductory-level course covers budgets and how they are used in organizational settings including the uses and functions of master budgets, operating budgets, sales, production, cost of goods sold budgets, and cash budgets. You will also learn about the budgeting process and how organizations are using different budgeting techniques to overcome operating challenges.

### ***Delivery Options:***

 All learning, lesson and final exams are delivered and taken online.

### ***Completion Time:***

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. recognize the uses and functions of budgeting
2. recognize the key activities, considerations, and benefits of strategic organizational planning
3. recognize the purpose and make-up of a master budget
4. identify the components and calculations used to create a master budget and recognize uses for this information
5. identify the components and purpose of an operating budget
6. recognize how sales, production, and cost of goods sold budgets are created and perform related calculations

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Introduction to Finance

## OVERVIEW

Understanding basic finance is important for any managerial position, even non-financial managers. This introductory-level course starts at the beginning, discussing finance as an organizational setting and legal forms of business. The course continues on to cover the responsibilities of financial managers, roles of finance in a typical business organization, and relevant financial markets of interest to financial managers. Further, the course will discuss corporate financing and the role the stock market plays in the business world.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is three hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. identify and differentiate the three most common types of business organizations and the structure of each
2. state the fundamental objectives of a corporation and the differences between wealth and profit maximization
3. recognize the impact of social and ethical responsibility on business
4. identify and describe the structure and functions of the finance department within an organization
5. define the principal-agent relationship and strategies for overcoming conflicts of interest and motivating managers
6. list and define the five key principles that form the foundation of financial management
7. recognize and define the five key financial markets
8. identify the sources, rules, and life-cycle stages of corporate financing
9. describe the function of the stock market and the three trading venues it utilizes
10. recognize the factors related to interest rate determination and the impact of interest on an organization

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

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# Introduction to Business

## OVERVIEW

Introduction to Business focuses on the critical business knowledge needed to succeed in the broadband industry. Combining broadband industry-specific case studies with textbook business theory, this course explores management, marketing, operations, accounting systems and finance. The student will also learn about ethics in the workplace, human resources, labor relations, managerial styles and strategies for improving job satisfaction and work performance. Students completing this course will be uniquely positioned to understand and manage the critical components of a broadband business.

### **Delivery Options:**

 The course is delivered online. An e-book is also provided.

### **Completion Time:**

The estimated completion time for this course is 32 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » understand the fundamental principles that drive, affect and shape broadband businesses
- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Technical and nontechnical leadership personnel who require industry and business knowledge for everyday decision making, including:

- » financial decision makers
- » current managers
- » aspiring managers

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. explain the U.S. business system and how business is conducted
2. discuss the global context of business
3. discuss conducting business responsibly and ethically
4. explain how to manage and organize a business
5. explain entrepreneurship and the small business
6. explain managing human resources and labor relations
7. discuss motivating, satisfying and leading employees
8. explain marketing processes and consumer behavior
9. discuss pricing, promoting, developing and distributing products/services
10. discuss quality improvement and production management
11. discuss accounting and information systems
12. discuss money and banking
13. discuss securities and investments
14. be better prepared to organize, motivate and lead a business group

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Supervision
- » Introduction to Marketing
- » Principles of Management

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

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## COURSE OUTLINE

- 1. The U.S. Business Environment**

The concept of business and profit, the external environment of business, economic systems, the economics of market systems and economic indicators
- 2. Understanding Business Ethics and Social Responsibility**

Ethics in the workplace, social responsibility, areas of social responsibility, implementing social responsibility programs and the government and social responsibility
- 3. Entrepreneurship, New Ventures and Business Ownership**

What is a small business, entrepreneurship, starting and operating a new business, trends, successes and failures in new ventures, non-corporate business ownership and corporations
- 4. Understanding the Global Context of Business**

The contemporary global economy, international business management, the cultural environment and barriers to international trade
- 5. Managing the Business**

The management process, types of managers, management roles and skills, strategic management: setting goals, formulating strategy, contingency planning and crisis management, management and the corporate culture
- 6. Organizing the Business**

What is organizational structure, the building blocks of organizational structure, establishing the decision-making hierarchy, basic forms of organizational structure and the informal organization
- 7. Operations Management and Quality**

What operations means today, creating value through operations, business strategy as the driver of operations, operations planning, scheduling and control, quality improvement and Total Quality Management and adding value through supply chains
- 8. Employee Behavior and Motivation**

Forms of employee behavior, individual differences among employees, matching people and jobs, basic motivation concepts and theories, strategies and techniques for enhancing motivation
- 9. Leadership and Decision Making**

The nature of leadership, early approaches and the situational approach to leadership, leadership through the eyes of followers, special issues in leadership, the changing nature and emerging issues in leadership, management and decision making
- 10. Human resource Management (HrM) and Labor Relations**

The foundations of HRM, staffing the organization, developing the workforce, compensation and benefits, the legal context of HRM, new challenges in the changing workplace, dealing with organized labor and collective bargaining
- 11. Marketing Processes and Consumer Behavior**

What is marketing, target marketing and market segmentation, understanding consumer behavior, organizational marketing and buying behavior, what is a product, developing new products, identifying products, the international marketing mix, small business and marketing mix
- 12. Developing and Pricing Products**

Developing new products, product life cycle
- 13. Distributing and Promoting Products**

Wholesaling, retailing, physical distribution, promotions and personal selling
- 14. Information Technology (IT) for Business**

A driver of change for business, IT building blocks, harnessing the competitive power of IT, IT risks and threats and IT protection measures
- 15. The Role of Accountants and Accounting Information**

What is accounting, the accounting equation, financial statements, reporting standards and practices, analyzing financial statements, accounting ethics and internationalizing accounting
- 16. Understanding Money and the Role of Banking**

The U.S. financial system, how financial institutions create money and are regulated, the federal reserve system and international banking and finance
- 17. Managing Business Finances**

Maximizing capital growth, investing to fulfill financial objectives, the business of trading securities, the risk-return relationship, financing the business firm, becoming a public corporation and regulating securities markets



# Introduction to Marketing

## OVERVIEW

Introduction to Marketing explores the cornerstone concepts that influence a customers' buying habits. The course describes how broadband companies aim to understand consumers, develop marketing strategies, conduct research and analyze information to target and sell to key market segments. The curriculum combines textbook principles, online exercises, industry-specific case studies and real-life situations to show how to translate marketing theory to everyday business. Some of the topics covered include: creating marketing for new products, implementing pricing strategies, handling distribution channels, forming integrated marketing communications with advertising, sales promotion, public relations, personal selling and direct marketing.

### **Delivery Options:**

 Learning is a combination of online and textbook activities.

### **Completion Time:**

The estimated completion time for this course is 32 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

- » customer service personnel
- » sales staff
- » supervisory staff
- » management

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. define marketing and outline the steps in the marketing process
2. explain marketing's role in strategic planning and how marketing works with its partners to create and deliver customer value
3. describe the environmental forces that affect the company's ability to serve its customers
4. explain the importance of information in gaining insights about the marketplace and customers
5. understand the consumer market and the major factors that influence consumer buyer behavior
6. define the major steps in designing a customer value-driven marketing strategy: market segmentation, targeting, differentiation and positioning
7. define product and describe the major classifications of products and services.
8. explain how companies find and develop new product ideas
9. identify the three major pricing strategies and discuss the importance of understanding customer-value perceptions, company costs and competitor strategies when setting prices
10. explain why companies use marketing channels and discuss the functions these channels perform

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Principles of Management
- » Introduction to Business
- » Effective Supervision

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
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## COURSE OBJECTIVES *(Continued)*

11. explain the role of retailers and wholesalers in the distribution channel and describe the major types of retailers
12. discuss the changing communications landscape and the need for integrated marketing communications
13. discuss the role of a company's salespeople in creating value for customers and building customer relationships
14. define direct and digital marketing and discuss their rapid growth and benefits to customers and companies
15. discuss how the international trade system and the economic, political-legal and cultural environments affect a company's international marketing decisions

## COURSE OUTLINE

- 1. Marketing: Creating Customer Value and Engagement**  
What is marketing, understanding the marketplace and customer needs, designing a customer value-driven marketing strategy, preparing an integrated marketing plan and program, engaging customers and managing customer relationships, capturing value from customers and the changing marketing landscape
- 2. Company and Marketing Strategy: Partnering to Build Customer Engagement, Value and Relationships**  
Company-wide strategic planning: defining marketing's role, planning marketing: partnering to build customer relationships, marketing strategy and the marketing mix, managing the marketing effort, measuring and managing marketing return on investment
- 3. Analyzing the Marketing Environment**  
The microenvironment, the macroenvironment and responding to the marketing environment
- 4. Managing Marketing Information to Gain Customer Insights**  
Marketing information and customer insights, assessing marketing information needs, developing marketing information, marketing research and analyzing and using marketing information
- 5. Understanding Consumer and Business Buyer Behavior**  
Consumer markets and consumer buyer behavior, the buyer decision process, the buyer decision process for new products and business markets and business buyer behavior
- 6. Customer Value-Driven Marketing Strategy: Creating Value for Target Customers**  
Market segmentation and differentiation and positioning
- 7. Products, Services and Brands: Building Customer Value**  
What is a product, product and service decisions, services marketing and branding strategy: building strong brands
- 8. Developing New Products and Managing the Product Life Cycle**  
New product development strategy and process, managing new product development, product life-cycle strategies and additional product and service considerations
- 9. Pricing: Understanding and Capturing Customer Value**  
What is a price?, major pricing strategies, internal and external considerations affecting price decisions, new product pricing strategies, product mix pricing strategies, price adjustment strategies, price changes and public policy and pricing
- 10. Marketing Channels: Delivering Customer Value**  
Supply chains and the value delivery network, the nature and importance of marketing channels, channel behavior and organization, channel design decisions, public policy and distribution decisions and marketing logistics and supply chain management
- 11. Retailing and Wholesaling**  
Retailing and wholesaling
- 12. Engaging Consumers and Communicating Customer Value: Advertising and Public Relations**  
The promotion mix, integrated marketing communications, advertising and public relations
- 13. Personal Selling and Sales Promotion**  
Personal selling, managing the sales force, social selling: online, mobile and social media tools, the personal selling process and sales promotion
- 14. Direct, Online, Social Media and Mobile Marketing**  
Forms of direct and digital marketing, digital and social media marketing, traditional direct marketing forms and public policy issues in direct and digital marketing
- 15. The Global Marketplace**  
Global marketing today, looking at the global marketing environment, deciding whether to go global, deciding which markets to enter, deciding how to enter the market and deciding on the global marketing program and organization



# Principles of Management

## OVERVIEW

This course focuses on today's global, technology-driven business environment, covering topics such as strategic planning and change management. It provides a detailed exploration of what is needed to develop a successful business in a multicultural environment: leadership, setting objectives, decision making, staffing, communication, motivation and organizing. Also, students will draw on management theory in order to apply the organizational concepts that are needed to function effectively as a manager today. The curriculum combines textbook principles with online activities. Industry-specific case studies apply textbook theory to real-life situations.

### **Delivery Options:**

 The course is delivered online. An e-book is also provided.

### **Completion Time:**

The estimated completion time for this course is 44 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » earn three hours of college credit
- » receive an industry-recognized NCTI certificate of graduation

### **Ideal for:**

Technical and nontechnical leadership personnel throughout the organization, including:

- » current managers
- » aspiring managers

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. develop a successful leadership style
2. make better decisions affecting the organization
3. properly motivate employees to work toward organizational goals
4. recognize and address challenges related to multicultural business environments
5. establish effective leadership and business goals
6. plan and manage change
7. successfully build and lead teams
8. improve decision making about staffing

## COURSE OUTLINE

### **1. Introducing Modern Management: Concepts and Skills**

A manager's task, management process and organizational resources, the key to management success and management careers

(Continued)

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Introduction to Business
- » Introduction to Marketing
- » Effective Supervision

## TRAINING FEATURES

- » Knowledge-based, broadband and job-specific content
- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online lesson feedback and progress monitoring at [www.ncti.com](http://www.ncti.com)
- » Online testing
- » **Instructor led training available upon request**

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.





## COURSE OUTLINE *(Continued)*

### **2. Management and Entrepreneurship: Handling Start-Ups and New Ventures**

Fundamentals of entrepreneurship, types of opportunities, opportunity identification, opportunity evaluation, opportunity exploitation, financing exploitation, corporate entrepreneurship and social entrepreneurship

### **3. Society, Ethics and Sustainability**

Fundamentals of social responsibility, social responsiveness, the social audit challenge, the philanthropy challenge, the sustainable organization challenge and managers and ethics

### **4. Management and Diversity**

Defining diversity, advantages of diversity in organizations, management challenges with diverse populations, strategies for promoting diversity in organizations and how managers promote diversity

### **5. Managing in the Global Arena**

Fundamentals of international management, categorizing organizations by international involvement, multinational corporations, the workforce of multinational corporations, management functions and the multinational corporations, transnational organizations and international management special issues

### **6. Creativity and Innovation**

Creativity in individuals, increasing creativity in organizations, innovation and creativity, the innovation process, catalyst for creativity and innovation: total quality management, the quality improvement process

### **7. Plans and Planning Tools**

General characteristics of planning, types of plans, planning process steps, planning's foundation, management by objectives (MBO) and planning tools

### **8. Making Decisions**

Fundamentals of decisions, rational decision making, decision-making and intuition, decision-making tools and group decisions

### **9. Strategic Planning: Strategies, Tactics and Competitive Dynamics**

Strategic planning and strategy, strategic management process, environmental analysis, establishing organizational direction, strategy formulation tools, strategy implementation, strategic control, tactical planning and competitive dynamics

### **10. Fundamentals of Organizing**

Organizing and organizing skill, Weber's bureaucratic model, division of labor, structure and types of departmentalization

### **11. Responsibility, Authority and Delegation**

Responsibility and job descriptions, dividing job activities, clarifying job activities, authority, delegation and centralization and decentralization

### **12. Human Resource Management**

Appropriate human resources, recruitment, selection, training and performance appraisal

### **13. Changing Organizations: Stress, Conflict and Virtuality**

Fundamentals of changing an organization, factors to consider, change and stress and conflict and virtuality

### **14. Influencing and Communication**

Influencing, emotional intelligence, communication, interpersonal communication and encouraging organizational communication

### **15. Leadership**

Approaches to leadership, how leaders make decisions, leaders changing organizations, leaders coaching others and emerging concepts for modern times

### **16. Motivation**

Process theories, content theories: human needs, importance of motivation and motivation strategies

### **17. Groups and Teams**

Kinds of Groups, managing work groups, team development stages and collaboration and effective teams

### **18. Building Organization Culture**

Fundamentals, functions and types of organizational culture, building a high-performance organization culture and keeping organization culture alive and well

### **19. Controlling, Information and Technology**

Fundamentals, the controlling process, power and control, essentials of information and the information system

### **20. Production and Control**

Production and productivity, Quality and productivity, operations management and control and control tools



# Project Management Team Leadership

## OVERVIEW

This course covers the roles and responsibilities of the project management team leader, in particular, their responsibility with regard to project stakeholders. The course also discusses how project management team leaders can build a positive team environment through effective communication, team building activities, problem-solving, and reflective listening.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is 18 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. define a team and identify six common types of teams
2. explain Bruce Tuckman's model of group development
3. describe how the project life cycle is relevant to team issues
4. list the three sources of power for project management team leaders
5. describe ways to manage stakeholder expectations
6. explain different types of team building activities
7. define reflective listening
8. identify the challenges of virtual teams and how they relate to the project management team leader's roles
9. compare and contrast voting and consensus as methods for decision-making
10. more effectively identify and resolve team problems
11. explain the different characteristics of effective and open team communication
12. identify the best practices for using e-mail and telephone among team members
13. identify several common team problems and apply methods for resolving these issues

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with





# Managing Real World Projects

## OVERVIEW

This course presents a streamlined approach to project management based on the best practices of experienced, effective project managers. It cuts through the clutter and focuses on the key principles of project management in the real world, offering tools and techniques for achieving project success. This course provides a clear road map for leading a project through the five key project stages: initiating, planning, controlling, executing, and closing. You'll be exposed to the basic tools employed in each of these stages, including templates for a comprehensive project plan, work breakdown schedules, task list, issue list, risk register, and close-out documents. Each stage is illustrated by examples and video commentary by project management professionals, where you can see how best practices are applied to solve project challenges.

### **Delivery Options:**

 All learning, lesson and final exams are delivered and taken online.

### **Completion Time:**

The estimated completion time for this course is 10 hours. The maximum allotted time is four months from enrollment.

## BENEFITS

Upon completion students will:

- » receive a MindEdge Certificate of Completion

## COURSE OBJECTIVES

Upon completing this course, students will be able to:

1. understand the five project stages (initiating, planning, controlling, executing, and closing)
2. recognize constraints for projects (scope, time, and budget)
3. explain key project management terminology
4. outline the keys to a successful project launch
5. understand how to establish project goals and deliverables with stakeholders
6. manage the planning, execution, and control of your projects
7. recognize project management best practice, including agile, lean, and other techniques
8. understand project team dynamics
9. understand how to communicate clearly with stakeholders and project team members
10. recognize effective tools for change management
11. explain and employ key tools and techniques employed in the five stages
12. manage the closing process for your project, including transfer, acceptance, and approval

## TRAINING FEATURES

- » Highly illustrated and easy to read course materials
- » Career path advisement
- » Online testing

Visit [www.ncti.com](http://www.ncti.com) and click **FAQ** for important information on computer hardware/software requirements and NCTI course policies.

Produced in Conjunction with



# Introduction to PC Applications

Introduction to PC Applications teaches the basics of computer use while also providing a thorough understanding of application suite software. The course covers Microsoft Office, the most common suite of software applications found in the business environment. By completing a series of tutorial exercises, the student will learn how to use Word, Excel, Access and PowerPoint. The course also demonstrates how specific functions can be shared by these applications.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a ten week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit [ncti.com/course/introduction-pc-applications](http://ncti.com/course/introduction-pc-applications) for a complete course description and to view a list of start dates.

# Stress Management

Work related stress has an enormous impact on job performance and health. Stress Management, a Web Classroom course, is an invaluable resource that teaches working professionals how to better manage and minimize the impact of stress. The course helps people understand how to identify and minimize the negative physiological, emotional and behavioral impact of stress. It also shows how to recognize stress related symptoms and the skills and techniques needed to apply to handle stress. In particular, it provides specific information on how to best manage anger in the workplace. It also demonstrates the relationship between stress and issues such as time management, attitude, assertiveness, exercise and nutrition. Those completing this course will be better able to identify and cope with rising levels of stress and, in turn, maximize their effectiveness on the job.

### **Delivery Options:**

 Web Classroom: Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a ten week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/stress-management> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

### RELATED COURSES

*Students completing this course should then enroll in:*

- » Effective Supervision
- » Introduction to Business
- » Introduction to Marketing
- » Principles of Management
- » Business Law and the Legal Environment

**COLLEGE CREDITS: 3**

### RELATED COURSES

*Students completing this course should then enroll in:*

- » Excellence in Customer Service
- » Customer Service for Technicians
- » Business Writing
- » Effective Supervision

# Technical Writing

Students in the Technical Writing course will develop skills that can be applied to a variety of technical documents. The course focuses on the principles for organizing, writing and revising clear, readable documents for industry, business and government.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/technical-writing> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Business Writing
- » Time Management
- » Introduction to Business
- » Introduction to Marketing

# Technical Mathematics

Technical Mathematics covers material designed for career technical or general studies for students who need to study particular mathematical topics. Topics will include measurement, algebra, geometry, trigonometry, graphs and finance. These are presented on an introductory level and the emphasis is on applications.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/technical-mathematics> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 4**

## RELATED COURSES

*Students completing this course should then enroll in:*

- » College Algebra
- » English Composition
- » Introduction to PC Applications
- » Introduction to Business



## Cultural Diversity in Business

Cultural Diversity in Business is the business person's guide to cultural, travel and information resource needs in the international arena. The course also covers specifics in negotiation, communication (verbal and nonverbal), networking and understanding what individual countries' needs are as to business culture.

**Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

**Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/cultural-diversity-business> for a complete course description and access the ACC Schedule of Classes.

COLLEGE CREDITS: 3

**RELATED  
COURSES**

*Students completing this course should then enroll in:*

- » Intercultural Communications
- » Effective Supervision
- » Principles of Management
- » Interpersonal Communication

## Business Writing

Business Writing focuses on specific business writing processes needed to produce business memos, email, good and bad news messages, reports, graphics in writing, electronic presentations and proofreading.

**Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

**Completion Time:**

This is a ten week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/business-writing> for a complete course description and access the ACC Schedule of Classes.

COLLEGE CREDITS: 1

**RELATED  
COURSES**

*Students completing this course should then enroll in:*

- » Introduction to Business
- » Introduction to Marketing
- » Principles of Management
- » Effective Supervision



# Time Management

Time Management provides students with the conceptual knowledge and tools to make better use of their time in the management function.

**Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

**Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/time-management> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 1****RELATED COURSES**

*Students completing this course should then enroll in:*

- » Effective Supervision
- » Principles of Management
- » Introduction to Business
- » Interpersonal Communication

# Leadership

Focuses on the leadership skills necessary to bring about change in an organization. Students learn to develop and communicate a shared vision, empower employees, manage conflict as well as negotiate and develop organizations so that all are working toward common goals.

**Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

**Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is **not** eligible for extensions or transfers.

Visit <http://ncti.com/course/leadership> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3****RELATED COURSES**

*Students completing this course should then enroll in:*

- » Interpersonal Communication
- » Intercultural Communication
- » Effective Supervision
- » Principles of Management

# Intercultural Communications

Intercultural Communications explores the link between culture and communication and will enhance communication skills and the abilities appropriate to a multicultural society. Emphasis will be on understanding diversity within and across cultures. Relevant concepts include perception, worldview, context, ethics, language and nonverbal communication.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/intercultural-communications> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

### **RELATED COURSES**

*Students completing this course should then enroll in:*

- » Cultural Diversity in Business
- » Effective Supervision
- » Principles of Management
- » Interpersonal Communications

# Interpersonal Communication

Interpersonal Communication examines the communication involved in interpersonal relationships occurring in family, social and career situations. Relevant concepts include self-concept, perception, listening, nonverbal communication and conflict.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/interpersonal-communication> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

### **RELATED COURSES**

*Students completing this course should then enroll in:*

- » Intercultural Communication
- » Principles of Management
- » Principles of Supervision
- » Cultural Diversity in Business
- » Stress Management



# Business Communication and Report Writing

Business Communication and Report Writing emphasizes effective business writing and covers letters, memoranda, reports, application letters and resumes. Includes the fundamentals of business communication and an introduction to international communication.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/business-communication-and-report-writing> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Technical Writing
- » Cultural Diversity in Business
- » Project Management in Organizations
- » Introduction to Business
- » Principles of Sales

# Project Management in Organizations

This course introduces students to the planning, implementation and control activities of project management, including project and performance evaluation, quality control and workflow analysis. Emphasis will be on the initiating, planning, executing, controlling and closing activities of project management.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10-week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

**COLLEGE CREDITS: 3**

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Business Writing
- » Cable Network Overview
- » Delivering Cable Services
- » Basic Broadband Troubleshooting
- » High Speed Data Customer Service
- » Advanced High-Speed Data Customer Service
- » Negotiation and Conflict Resolution
- » Principles of Sales

# Negotiation and Conflict Resolution

Negotiation and Conflict Resolution presents proper techniques in negotiation and conflict resolution. Key practices that determine successful negotiation are explored. This course covers principles of conflict resolution including business policies, accepted business practices contracts, labor union contracts, pay raises and starting salaries.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a ten week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/negotiation-conflict-resolution> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

### RELATED COURSES

*Students completing this course should then enroll in:*

- » Interpersonal Communication
- » Stress Management
- » Cultural Diversity in Business
- » Business Communication and Report Writing
- » Customer Service

# Principles of Sales

Principles of Sales enables the student to understand and develop ethical sales techniques and covers the role of selling in the marketing process. Areas of emphasis include behavioral considerations in the buying and selling process and sales techniques.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

Visit <http://ncti.com/course/principles-sales> for a complete course description and access the ACC Schedule of Classes.

**COLLEGE CREDITS: 3**

### RELATED COURSES

*Students completing this course should then enroll in:*

- » Customer Service
- » Legal Environment of Business
- » Intercultural Communication
- » Principles of Marketing



# Organizational Communication

This course focuses on the role of communication theory and skills as they apply to business and organizational settings. Topics include organizational and leadership models, effective communication skills with peers, superiors, and subordinates, environmental factors impacting communication and interviewing skills.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10 week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

# Group Communication

This course examines group communication theories with an emphasis on leadership and group behaviors. The course provides opportunities for group participation.

### **Delivery Options:**

 Learning takes place with an instructor in an online classroom and will include homework activities and weekly assignments.

### **Completion Time:**

This is a 10-week accelerated course which will require weekly assignments and periodic online communication with an instructor. This course is not eligible for extensions.

**COLLEGE CREDITS: 3**

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Business Writing
- » Cable Network Overview
- » Delivering Cable Services
- » Basic Broadband Troubleshooting
- » High-Speed Data Customer Service
- » Advanced High-Speed Data Customer Service
- » Negotiation and Conflict Resolution
- » Principles of Sales

**COLLEGE CREDITS: 3**

## RELATED COURSES

*Students completing this course should then enroll in:*

- » Business Writing
- » Cable Network Overview
- » Delivering Cable Services
- » Basic Broadband Troubleshooting
- » High-Speed Data Customer Service
- » Advanced High-Speed Data Customer Service
- » Negotiation and Conflict Resolution
- » Principles of Sales