



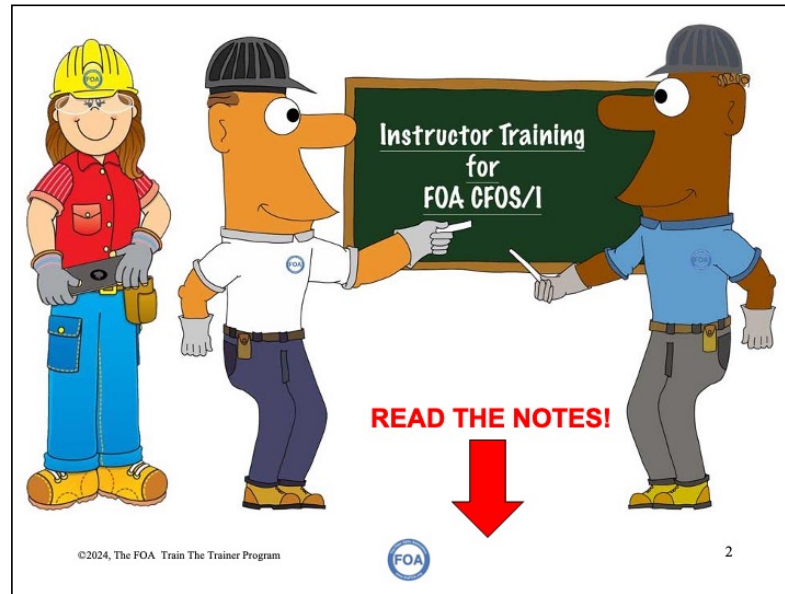
# Instructor Certification Training

**READ THE NOTES!**



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Go through this presentation and read all the comments in the Notes carefully as you look at the slides. That will prepare you for the FOA Instructor Certification exams. PLEASE READ ALL THE NOTES – they will explain what you need to know. If you have questions, contact FOA at [info@foa.org](mailto:info@foa.org)



The Fiber Optic Association certifies instructors. While we would prefer to have them attend a Train-The-Trainer (TTT) course in person, it is unrealistic to expect that all FOA instructors around the world can come to us.

This is the PowerPoint presentation we use for TTT classes. It's annotated so all the FOA designated TTT instructors can use it to give the same class, but it also allows anyone reading it to get practically the same information that they would get attending the seminar.

So go through this presentation. Read all the comments in the Notes carefully as you look at the slides. We think you will get the gist of our programs and will prepare yourself for the FOA Instructor Certification exams.

If you have questions, contact FOA at [info@foa.org](mailto:info@foa.org)

## FOA Instructor Training & Preparation For the Certification Exam



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3

Go through this presentation in detail as it is the basis of the teaching section of the CFOS/I and CPCT/I written exam and includes information on how FOA certifies instructors and how they can conduct FOA certification courses.

Read all the comments in the Notes carefully as you look at the slides. We think you will get the gist of our TTT seminars and will prepare yourself for the FOA Instructor Certification exam.

If you have questions, contact us at [info@foa.org](mailto:info@foa.org).

## Which Instructors Must Be Certified?

- All instructors teaching FOA courses at FOA approved schools must be certified by the FOA
- Instructors must be submitted by the school and their certification is for teaching at that school only
- Resumes must be submitted to FOA for approval
- Instructors must complete an assigned course at Fiber U with a score of 80% or greater
- All instructors must pass an instructor certification exam with a score of 80% or greater
- Instructors must have the certification for every course topic they teach

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4

All instructors teaching certification courses at FOA schools must be FOA certified instructors, CFOS/I for fiber optics and CPCT/I for premises cabling. If the school is teaching other courses such as CFOS/S for splicing, the instructor must achieve that certification also.

The application process begins with the school submitting a resume for the FOA to review. Once approved the instructor will be assigned a Fiber U online course to complete, including achieving a score of 80% or higher on the Certificate of Completion exam. When FOA decides the instructor is ready, they will take the appropriate instructor exam, CFOS/I or CPCT/I, which they must again achieve a score of 80% or higher.

If the school offers other FOA certification courses, the instructor will be required to obtain those certifications before the school is allowed to offer that certification.



## What Must An Instructor Know?

- Fiber optic technology to teach classroom sessions
- Hands on skills to teach labs
- About the FOA and how it benefits the student
- How to teach a FOA certification course
  - Curriculum requirements
  - Classroom and lab requirements
  - Paperwork and procedures
- ***Have you reviewed the KSAs for Instructors?***

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5

FOA requires every instructor teaching a FOA certification course must first know fiber optic or premises cabling technology in order to teach it and have the skills necessary to lead the hands-on lab exercises. In addition, the instructor must know what the FOA is, how to explain its certifications to students and administer the course including the exams. It is vitally important that the instructor be familiar with the paperwork to be submitted to the FOA as students are always impatient to receive their credentials and often call us trying to speed up the process!

Review the FOA KSAs for instructors here: <https://www.thefoa.org/TTT/KSAs-for-instructors.html>

## Our Goals

- To prepare you for the instructor exam
  - Describe the FOA and its purposes
  - Define the responsibilities of an FOA-Approved school
  - Set standards for a good FOA certification class
  - Examine what classes should cover
  - Discuss instructor KSAs (knowledge, skills and abilities)
  - Share resources for training and assistance
  - Give recommendations on how to teach a course

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6

We are not going to teach you the technology or fiber optics or premises cabling, nor will we have time to coach you in teaching skills. But we will share with you experiences, methods, tricks; anything that helps us all become better instructors. We will also spend some time on resources for your classes, how to market your courses better and how we can work together better.

## The CFOS/I And CPCT/I Exams

- Online exam
- Requires knowledge of basic fiber optics (CFOT level) or premises cabling (CPCT)
- Requires knowledge of The FOA and its school procedures. Study these slides. If you do not study this material, you will probably not pass the exam!
- Those who pass the CFOS/I exam will automatically get a CFOT or CPCT plus a provisional instructor certification (IP) that will be reviewed after you have been conducting classes for one year.
- At the end of the provisional year you will be reviewed to become a CFOS/I certified instructor.

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7

We are not going to teach you fiber optics or premises cabling nor will we have time you coach you in teaching skills. But we will share with you experiences, methods, tricks; anything that helps us all become better instructors.

We will also spend some time on resources for your classes, how to market your courses better and how we can work together better.

All instructors have provisional instructor status (IP) for one year, pending the successful completion of teaching courses.


**X**

## Recommended Class Rules

(Ours When We Give a Class)

- Turn mobile devices and cell phones off or mute
- Leave quietly if you must
- No smoking or eating (a safety issue)
- Keep work areas clean
- Participate in the discussions
- Enjoy yourself!

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8


If we were giving a seminar to live students, we would start with these rules. We assume you have these kinds of rules in your classes!

## Class Introductions

(Ours When We Give a TTT Class)

- Instructor
  - who you are
  - background
  - experience
- Students
  - who you are
  - why you are here
  - background
  - what you know about fiber optics or cabling
  - what you expect from this class

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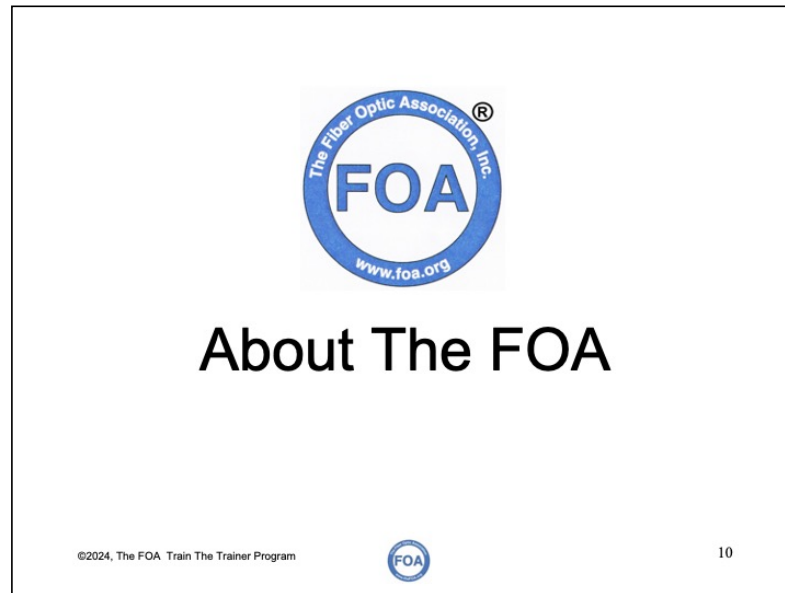


9

We always like to start a class with introductions:

Instructor - who you are, background, experience

Students - who you are, background, what you already know about fiber optics, why you are here



The Fiber Optic Association is an international professional association and certifying body. FOA is NOT a training organization – FOA supports a worldwide network of training organizations who teach fiber optics and premises cabling for FOA certification.

If you have questions, contact us at [info@thefoa.org](mailto:info@thefoa.org) or [info@foa.org](mailto:info@foa.org) (both work).

## What Is The FOA ?

- The international professional association of fiber optics and recognized certifying body
- Organized in 1995 by ~15 professional trainers from industry, education, military/government to educate and certify a workforce capable of building fiber optic networks to support the growth of the Internet.
- **Chartered to promote fiber optics through education, certification and standards**
- Not-for-profit educational corporation (IRS 501 c(6))

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11

### What is The FOA?

Fiber optics has become the predominant communications medium, not just for the Internet but also wireless, cable television, security systems and computer networks. Workers in all these fields are expected to understand how fiber optics is used and, in many cases, be competent in its installation. Training in these areas has become extremely important and The Fiber Optic Association is prepared to help.

The FOA is a international non-profit educational organization that is dedicated to promoting professionalism in the field of fiber optics. It was founded in 1995 by a dozen prominent fiber optics trainers and industry personnel who felt an industry-wide non-aligned certification program was important for the growth of the industry, especially since the then-new Internet was causing a giant boom in fiber optic network construction.

For more information, see our website <http://www.foa.org>

## What Is The FOA ?

- FOA is NOT a training organization.
- FOA is a certifying body granting certifications following the ISO 17024 standard
- As of the end of 2023
  - >200 approved schools in >40 countries
  - >94,000 certificants – the latest number is on the home page
  - holding over 130,000 total certifications – including specialist certifications
  - Adding ~5000 new certified techs each year

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12

### What is The FOA?

FOA is not a training organization, we are a certifying body. We set the standards for technician certification and standards for training. We provide curriculum to schools, train and certify instructors, provide testing services for the certifications we offer.

The FOA has more than 200 approved training programs in >40 countries. They include technical high schools and colleges, professional training organizations, telecom service providers, military services and other companies offering employee training programs. A very large proportion of the world's fiber techs have successfully completed requirements for the FOA CFOT Certified Fiber Optic Technician certification.

For more information, see our website <http://www.foa.org>



## FOA Goals

- Develop the workforce needed to build the world's telecommunications networks
- Promote professionalism in fiber optics through education and certification
- Administer certification programs for basic and specialist levels for both skills and applications
- Develop teacher skills in fiber optics
- Provide free technical resources to the industry
- Participate in standards activities

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13

To achieve these goals, the FOA is involved in:

1. Creating and maintaining the world's largest knowledge base in fiber optics and cabling, online and printed
2. Administering technical certification programs
3. Evaluating and approving training schools
4. Developing courses and training programs for both classroom and online
5. Training instructors
6. Participating in industry standards activities
7. Publishing an online newsletter
8. Participating in trade shows as exhibitor, presenter and co-sponsor
9. Promoting fiber optics applications and education

The FOA recognizes the value of certification in today's job markets, where employers evaluate potential employees by their certifications. By offering certifications that are developed by a board of industry experts and are not affiliated with any particular vendor or training organization, we provide an independent means for employers to judge potential employees.

## FOA Programs

- FOA is NOT a training organization – it is a certifying body - all student training is done by FOA Certified Instructors at FOA Approved schools
- FOA administers certification programs, e.g. CFOT®
- Maintains certificant database
- Create a network of approved training organizations
- Train and certify instructors

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14

Allow us to say this again – FOA is not a training organization – we are a nonprofit educational organization set up to support the fiber optic industry, These are things we do to support our work.

## FOA Programs

- Maintain a free industry knowledge base
- Create and publish technical reference materials both online and printed
- Creates technical curriculum to assist schools
- Offer free online learning courses at Fiber U
- Maintain website, email and online newsletters
- Active in standards activities (TIA, ISO, NECA)
- Train and certify instructors

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15

Allow us to say this again – FOA is not a training organization – we are a nonprofit educational organization set up to support the fiber optic industry, These are things we do to support our work.

## FOA Supports Our Industry

- FOA programs are designed to support everyone in the industry
- Techs who design, install and operate communications systems
- Instructors teaching fiber optics
- Students learning fiber optics
- Schools offering training programs
- Manufacturers, distributors, contractors
- International standards bodies
- Network owners, planners, designers, etc.

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16

### How Does The FOA Help The Fiber Optic Industry?

**For Instructors, Schools and Training Organizations:** The FOA offers a range of services including online instructor training, certification, training curriculum materials and support that leads to becoming an "FOA-Approved Training Organization" Once your school is approved, you can offer the CFOT certification program to your students for a very low cost. The FOA lists all approved schools on the FOA website as a guide to students looking for quality training.

The FOA "Train-The-Trainer" program leads to certification for fiber optic instructors. This program prepares instructors for creating and teaching hands-on courses for fiber optic or cabling technician training and lab courses for university level programs.

**For Students of FOA Approved Schools:** FOA Certification Programs open up job opportunities and assure customers of worker competence. Passing the various levels of the FOA certification program will demonstrate a level of competence in the fiber optics field to employers or customers, whether the worker is new to the industry or looking to move up.

**For Everyone In The Industry:** The FOA website offers a monthly online newsletter covering industry news and technology. The Tech Topics section offers an extensive library of technical information and tutorials on fiber optics. Numerous links to other relevant websites are included. And full information on the FOA and its programs are available for everyone.

**Standards:** And the FOA is lending its expertise in fiber optics to help create and improve standards, like the TIA 568 premises cabling standard and the NECA 301 fiber optic installation standard.

FOA®, Fiber U® and CFOT® are registered trademarks of The Fiber Optic Association,

Inc.

## FOA Organization

- FOA is a virtual organization
- Headquarters in Santa Monica, CA
- Jim Hayes, President
- Karen Hayes, Administrative Manager
- Board of Directors
  - Tom Collins, Gateway Comm. Tech. College, JATC
  - Bill Graham, Mississauga Training Consultants
  - Jerry Morla, Zayin Fiber Optics
  - Karen & Jim Hayes, co-founders, ex-Fotec/Fiber U


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17


The is a virtual organization, founded after the Internet so it has no “brick and mortar” offices. The FOA is managed by two of its founders from an office in California with the assistance of a Board of Directors and a worldwide group of advisors that includes dozens of very experienced people in fiber optics- averaging more than 20 years experience in the industry.

## FOA Certifications



- FOA Certifications are recognized worldwide
- Certifications cover basic fiber optics and premises cabling, skills and knowledge of applications
- Created by industry experts based on job task analysis and KSAs – knowledge, skills and abilities – needed for competence in that job
- Review on FOA website:
  - <http://www.foa.org/Certs.htm>
  - <http://www.foa.org/KSAs.html>

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18

FOA certifications cover basic fiber optics and premises cabling, skills and knowledge of applications


They are created by industry experts based on KSAs – knowledge, skills and abilities – needed for competence

Review on FOA website:

<http://www.foa.org/Certs.htm>

<http://www.foa.org/KSAs.html>


## FOA Certifications First Level



FOA offers two first level certifications available to all:

- **CFOT (Certified Fiber Optic Technician)**
  - Basic level knowledge certification for all fiber techs
- **CPCT (Certified Premises Cabling Technician)**
  - Basic level certification for copper/fiber/wireless

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19

The FOA offers three first level certification, any of which can be taken by new members of the FOA.

CFOT. Certified Fiber Optic Technician program is based on an extensive knowledge of fiber optic technology and application. While it does not require hands-on skills, most certificants come from schools where hands-on exercises are a big part of the curriculum.

CPCT (Certified Premises Cabling Technician) Basic level certification for copper/fiber/wireless as used in premises (building and campus) installations.



## FOA Certifications CFOT

- CFOT® – Certified Fiber Optic Technician
- Aimed at
  - Contractors and installers who will plan, design, build and operate fiber optic networks
  - Managers and supervisors who are responsible for these networks' installation and operation
- Provides background knowledge appropriate for practically any job involving fiber optics
- Requires knowledge, hands-on skills and abilities (KSA)
- Review CFOT KSAs (<https://www.foa.org/KSAs.html>)
- CFOT® is a registered trademark of FOA

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20

CFOT® – certified fiber optic technician is aimed at contractors who will design, build and operate fiber optic networks as well as managers and supervisors who are responsible for these networks' installation and operation. A CFOT has knowledge, skills and abilities appropriate for practically any job in any application involving fiber optics. CFOT requires installation skills to qualify the certification applicant.

CFOT® is a registered trademark of the FOA.

## FOA Certifications CPCT

- CPCT – Certified Premises Cabling Technician
- Aimed at
  - Contractors who will design, build and operate premises cabling networks including copper, fiber and wireless infrastructure
  - Managers and supervisors who are responsible for these networks' installation and operation
- Provides background knowledge appropriate for practically any job involving premises cabling including FTTH customer premises installation
- Requires installation skills to qualify the holder in copper and fiber optic installation processes

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21

CPCT - Certified Premises Cabling Technician - is the FOA certification for designers, installers and operators of premises cabling networks. Premises cabling refers to building and campus cabling that is generally customer-owned and used for local area networks of computers (LANs), security systems (CCTV and alarms), building management systems, distributed antenna systems (DAS for cellular and WiFi) and other applications inside buildings or on a campus. The FOA CPCT certification [KSAs](#) cover copper and fiber optic cabling and wireless communications.

## FOA Certifications CFOS Skills Specialists

### Skills

- CFOS/O - Outside plant construction and installation
- CFOS/S - Splicing – fusion (single fiber & ribbon) and mechanical
- CFOS/T - Testing – insertion loss, OTDR, specialty testing
- CFOS/C - Connectors & termination
- *All require CFOT as prerequisite*

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22

The FOA offers several specialist skills certifications.

CFOS. Certified Fiber Optic Specialist is the specialist certification program requiring both detailed knowledge and extensive experience. Skills specialists certifications are intended as an advanced certification for CFOTs with field experience, but it is also an opportunity for schools to offer advanced courses that focus on developing skills by repetition and working with more complex equipment.

## FOA Certifications CFOS Application Specialists

### Applications

- CFOS/H –Fiber to the home/MDU/curb, etc
- CFOS/L – OLAN – optical LANs
- CFOS/W – Fiber for wireless (cellular, WiFi, etc.)
- CFOS/DC – Data centers
- *Do not require CFOT but student must have adequate background or class should start with review*

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23

The FOA offers several specialist applications certifications.

CFOS. Certified Fiber Optic Specialist application certification programs requiring feature introductions to specific applications of fiber optics. These are for several types of students: 1) CFOTs or CPCTs wanting to learn new applications which they will design and install and 2) managers and supervisors wanting to know more about the networks they are responsible for. These courses and certifications are open to any person but if they are not familiar with fiber optics they need to study the "Basic Fiber Optics" course on Fiber U ([fiberu.org](http://fiberu.org)) or the class should include a short introduction to fiber optic technology.

## FOA Certifications CFOS/D

- CFOS/D - Design – designing fiber optic networks
- Aimed at
  - Contractors who will design networks and build them
  - Managers and supervisors who are responsible for these networks' installation and operation
- *Does not require CFOT but student must be have adequate background knowledge, e.g. Fiber U Basic Fiber Optics Certificate of Completion*
- Does not require installation skills nor qualify the holder for installation processes

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24

### CFOS/D – Certified Fiber Optic Specialist, Design

This is a specialist application certification covering fiber optic network design intended for network owners, IT personnel, facilities managers, network designers, estimators or technicians involved in the design or installation of fiber networks. This course is especially recommended for network owners and planners who may not be familiar with the process of fiber optic network design as it can make their jobs easier and their projects better.

**Prerequisites:** A review of basic fiber optic concepts and components is included in the course but a CFOT, CPCT or completion of the Fiber U Basic Fiber Optic including achieving the Certificate of Completion is required.

## What Are the Benefits of FOA Certification?



- Technicians who are “certified” are preferred by their customers and employers and generally earn more
- Many jobs require certification and most require FOA certifications
- The FOA certifications are the most recognized and preferred certification for fiber optics worldwide
- FOA works with many large employers, government and labor organizations to enhance employee knowledge and skills


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25


These are the benefits to certification. Certified techs are preferred because many customers and employers have had problems with fiber optic installers who are not competent and cause problems so they come to FOA for help in finding competent workers.

## What Are the Benefits of FOA Certification?



- FOA is a non-profit, independent, technical professional society and certifying body, not a training company or “certification factory” and the fiber optics world knows that and respects the FOA
- FOA is a non-profit organization supported by its income from certifications. Encourage your students to renew their certifications every three years – their support ensures the continued use of the free resources available at FOA.

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26

These are the benefits to certification. Certified techs are preferred because many customers and employers have had problems with fiber optic installers who are not competent and cause problems so they come to FOA for help in finding competent workers.

## FOA Certifications Renewal

- All FOA certifications are good for 3 years
- Renewal is required to maintain the certification and remain “active” in the FOA database
- Renewal covers all FOA certifications that person has attained – one fee for all certifications and all renew on the certified tech's anniversary date
- Renewal income helps support the FOA and all its programs

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27

AllFOA certifications are good for 3 years. Renewal is required every three years for the certification to remain active.

Renewal requires payment of a renewal fee plus there is a continuing education requirement starting in 2020. Note that the FOA renewal covers all certifications that person has attained – they do not require separate renewal or additional payment.



## References: FOA Textbooks



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28

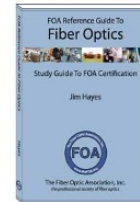
FOA publishes its own textbooks because we have full control of the content, we can update more often than commercial texts and we can sell them at a fraction of the cost of other textbooks. Plus, we can update the books as we desire, which is often annually. FOA has a basic fiber optics book in English, Spanish, Portuguese and French, an OSP – outside plant – book, a premises cabling (copper, fiber and wireless) in English and Spanish, a design book in English and Spanish and an OSP construction guide. The fiber broadband book is a combination of tech and history, written for broadband network planners who are just getting into fiber optics.

All these books are good references for the fiber optic designer, network owner, contractor, installer, facilities manager or anyone whose work involves fiber optics.

## References - CFOT

### The FOA Fiber Optic Textbook

- *The FOA Reference Guide to Fiber Optics*
- Edited by Jim Hayes, FOA President with an extensive group of knowledgeable advisors
- Complementary to the *FOA Online Reference Guide to Fiber Optics* website
- Low cost plus 40% discount to FOA schools
- Updated regularly
- Organized for training – full curriculum for schools is available free
- Paperback or Kindle
- *Available in English, Spanish, Portuguese and French*



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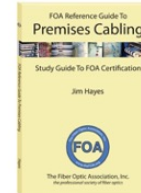
29

This is the basic fiber optic text developed by FOA subject matter experts to cover the KSAs of the CFOT.

## References - CPCT

### The FOA Premises Cabling Textbook

- *The FOA Reference Guide to Premises Cabling*
- Covers copper and fiber cabling plus wireless
- Based on the *FOA Online Reference Guide to Fiber Optics* website
- Low cost plus 40% discount to FOA schools
- Regularly updated
- Online training guides, study guides and complete curriculum available free to FOA schools
- Paperback or Kindle
- Available in English or Spanish



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30

This is the basic fiber optic text developed by FOA subject matter experts to cover the KSAs of the CPCT

## References – CFOS/O The FOA OSP Fiber Optic Textbook

- *The FOA Reference Guide to Outside Plant Fiber Optics*
- Covers OSP construction and installation
- Based on the *FOA Online Reference Guide to Fiber Optics* website
- Low cost plus 40% discount to FOA-approved schools
- Up to date materials
- Paperback or Kindle
- Online training guides, study guides and complete curriculum available free to FOA schools



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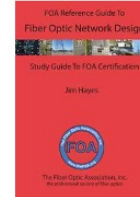
31

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## References – CFOS/D

### The FOA Fiber Optic Design Textbook

- *The FOA Reference Guide to Fiber Optic Network Design*
- Covers design, planning and project management
- Based on the *FOA Online Reference Guide to Fiber Optics* website
- Low cost plus 40% discount to FOA-approved schools
- Up to date materials
- Paperback or Kindle
- Online training guides, study guides and complete curriculum
- Available in English and Spanish



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32

This is the basic fiber optic text developed by FOA subject matter experts to cover the KSAs of the CFOS/D

## References – CFOS/T

### The FOA Fiber Optic Testing Textbook

- *The FOA Reference Guide to Fiber Optic Testing*
- Covers all aspects of fiber optic testing from basics to fiber characterization
- No other textbook like it – it is the most comprehensive text on fiber optic testing
- Based on the *FOA Online Reference Guide to Fiber Optics* website
- Low cost plus 40% discount to FOA schools
- Up to date materials
- Paperback or Kindle
- Online training guides, study guides and complete curriculum



Available printed,  
On Amazon Kindle

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33

This is the basic fiber optic text developed by FOA subject matter experts to cover the KSAs of the CFOS/T

## The FOA Online Reference Guide

- Online guide to fiber optic communications and premises cabling
- Almost 1000 pages
- Created by industry experts worldwide
- Updated continuously
- Trustworthy - no hype, no commercials
- 4 million page views per year!
- Has own Search engine
- Free!



[www.foaguide.org](http://www.foaguide.org)

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34

The *FOA Online Reference Guide To Fiber Optics and Premises Cabling* has been created as a free service to the fiber optics and communications industries, as well as any other field that uses fiber optics. It encompasses almost a thousand pages of technical information, online and video tutorials and tech bulletins covering every aspect of fiber optics and premises cabling. Everyone can use this as a reference source for fiber optics and premises cabling. Students at FOA-Approved Schools can use this as a reference textbook for FOA certifications and those already certified can use it for a reference on the technologies or practices. The website gets more than 3.5million page views per year from over 400K visitors

## FOA Channel on YouTube

- >100 videos on fiber optics and cabling
- ~60 Lectures on important topics
- ~3 million views
- Hands-on videos
- Some vintage but all relevant to the current fiber optic industry
- You Tube Channel: thefoainc
- [www.youtube.com/user/thefoainc](http://www.youtube.com/user/thefoainc)



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35

The FOA has more than 100 videos on YouTube, including Lecture Series on Fiber Optics and Premises Cabling, Hands-On lectures on both and some other informational and instructional videos. Some of these date back a decade or more but are all still relevant to today's fiber optic industry and applications.

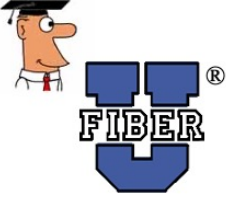
## You Tube Channel: thefoainc

<http://www.youtube.com/user/thefoainc>



## Fiber U

- Free online learning site for FOA
- Self-study programs based on FOA Online Reference Guide
- Preparation for FOA certifications
- Certificate of completion w/exam
- Recommended prerequisite for classes – students will be already familiar with the technology before class
- [www.fiberu.org](http://www.fiberu.org)



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Fiber U is back – it was the #1 training program of the 1990s and is now part of FOA for online training.

Fiber U is the free online training site for FOA, offering courses in every FOA certification topic plus some. Each class has a lesson plan based on the FOA Online Reference Guide and FOA YouTube videos. Every lesson has self-test quizzes that students can use to check their comprehension and an online test that will give them a "Fiber U Certificate of Completion."

Fiber U is being used by many of our regular schools – blended learning during the course or requiring students to complete online exercises before coming to class, then discussing what they learned online in class before having hands-on labs. It reduces the classroom time needed allowing more time for skills development in labs.



The slide features a large blue circular logo at the top center with the text "The Fiber Optic Association, Inc." around the top edge, "FOA" in the center, and "Approved Fiber Optic Training" around the bottom edge. Below the logo, the title "FOA Approved Schools" is displayed in a large, bold, black font. At the bottom left, there is a small copyright notice: "©2024, The FOA Train The Trainer Program". At the bottom center is a small blue circular logo with "FOA" inside. At the bottom right is the page number "37".

In this section we discuss the requirements and duties of an FOA approved training organization. If you have questions, contact FOA at [info@foa.org](mailto:info@foa.org) or [info@tfefa.org](mailto:info@tfefa.org).

## School Requirements

- Be an established training organization
- Teach an appropriate curriculum for certifications
- Conduct appropriate hands-on labs
- Use FOA certified instructors for certification courses
- Offer FOA certifications to all students in classes
- Understand and follow FOA procedures as outlined in the FOA School Handbook

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38

These are requirements for schools. Also see <https://www.foa.org/newschool/index.html>

FOA requires all organizations applying for approval to be evaluated on three major issues: the organization, the curriculum and the instructors.

FOA requires all schools to be established training organizations with a substantial history of providing training to the satisfaction of students. FOA will not approve any newly-established organization that wishes to become a training organization or established organization of any type that wishes to start a training operation.

Courses must include both classroom sessions and hands-on labs appropriate to the certification and the school must have appropriate equipment to teach students the knowledge and skills required by the certification. ([KSAs](#))

<https://www.foa.org/KSAs.html>

Organizations applying for FOA approval must designate the instructors for the courses. All instructors teaching courses that offer FOA certifications must meet [FOA requirements for instructors](#). <http://www.thefoa.org/TTT/index.html>

## Curriculum

- Schools may develop their own courses or use the free FOA curriculum and resources
- Curriculum must cover FOA KSA topics *and* develop basic hands-on skills appropriate for the certification
- For most FOA certification classes, about 50% course time should be classroom, 50% hands-on labs

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39

Schools may use their own curriculum or the FOA free curriculum as long as the course covers the FOA KSAs. Most courses will be about 50% classroom time and 50% hands-on labs.

Curriculum for FOA certification courses – also see  
<https://www.foa.org/instructors/class-reqs.htm>

## Classroom

- Cover topics relevant to students
- Cover the basic material in KSAs for the FOA certification
- Provide students with appropriate notes and/or references
  - FOA has low cost textbooks and eBooks
  - Can use the FOA Online Reference Guide website
  - PPT slides with notes are recommended

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40

In the classroom, FOA offers complete PPT slide presentations that cover the relevant topics in the KSAs which are used by most instructors. FOA encourages instructors adding slides from their personal experiences or vendors that enhance the presentation. Most schools provide the students with printed textbooks for reference but the FOA Guide online is also available. Students can be given printed or PDFs of the PPT slides for use in the course. FOA offers inexpensive textbooks THEN discounts them 40% for schools ordering directly from FOA.

The classroom is where students get the knowledge expected of a CFOT and

## Hands-On Labs

- Develop basic skills in using fiber optics
  - Cable handling and preparation
  - Splicing (more time for OSP)
  - Termination (more time for premises)
  - Testing
- Requires proper equipment, components and lab
- Instructors need to have proper skills/training
- *Instructors must verify students achieve acceptable skill levels as part of training process for certification*

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41

Hands-on labs are an integral part of FOA certification courses. Schools must have a properly equipped lab for student use and instructors familiar with the hands-on processes.

Instructors are required to verify that students have achieved acceptable levels of skills in the labs as a requirement for certification.

## School Procedures

- Download and read FOA School Handbook from School Secure Site as part of approval and certification processes
- Read and sign school agreement, renewed annually
- Download FOA curriculum materials from school secure site
- FOA administration will help with procedures

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42

### School requirements and procedures

Schools, once accepted into the FOA system, will have to sign a school agreement with provisions covered in the FOA School Handbook which will be provided to them at that time. Once approved, the school and instructor can download curriculum materials for use in their course. FOA admin people are always available to assist the school.

## School Procedures

- Offer certification to all students in FOA classes
- Properly complete FOA certification applications
- Administer exams properly – proctored, closed book
- Grade exams – maintain confidentiality of exams
- Verify skills of each student from observation in labs
- Follow numerical order for membership/CFOT #s
- Provide student with application receipt/certificate
- Promptly submit applications to FOA

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43

School requirements and procedures - summary



## Administering Exams

- The FOA certified instructor must administer exams
- Exams are online, graded and records kept
- Multiple versions of tests are available
- All exams are a “closed-book” exam and each student must do their own work!
- No time limit, but ~1>1.5hr is usual for exams
- Instructor who teaches the class must sign the student applications affirming that the student has shown required skills in labs. Never office staff!

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44

Every school gets access to a download site that contains the FOA certification exams and paperwork.

The instructor from the school must administer the exams.

Exams are online, graded and records kept automatically.

Many test versions are available, students all get a unique exam.

Each student must take the exam “closed book” without help - it is NOT a class exercise.

Every student can take time to finish it. Generally 1 to 1.5 hr is enough.

The exams automatically graded when finished. 70% is passing.

## Administering FOA Exams

- All students must fill in the FOA certification application and receipt/certificate form – download from FOA site
- Students get the receipt from the form – it is their record of their completing the course
- FOA will evaluate applications for certification and if approved, send the student a online credential to the email address on the application and test
- We send credentials and renewals to the student by email so we need a valid email address
- If they change contact information, have them tell FOA

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45

Each school should send back to the FOA a completed application form for each student that passes the exam and a school check or credit card to cover all students. Please do it within a few days after the end of class, as we get calls from students looking for their credential within a few weeks.

You should reate your own certificates showing the student completed the class and add the FOA logo on the form. FOA has templates.

**PLEASE MAKE SURE WE HAVE VALID EMAIL ADDRESSES FOR THE STUDENTS.** Inform them they will receive an online credential from us with 4-8 weeks (depends on how fast you get the info to us) and they must keep us informed of email address changes.

The FOA maintains a database of every CFOT since the beginning. Students will receive renewal notices on their certifications every 3 years.

## Administering FOA Exams

- School assigns a FOA Certification number
- Mark the score on the application - 70% is passing
- Do not return the student application to the FOA but keep a copy for your records and file the tests
- There is a spreadsheet form you email to FOA to submit new certifications.
- Use the online store to pay (preferred), send a PO or send one check to cover all students in the class
- Please do so in a timely fashion - we get calls from students soon after class is over looking for cards!

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46

Each school should send back to the FOA a completed application spreadsheet for the class including information for each student that takes the exam and pay once to cover all students in the class. Please do it within a few days after the end of class, as we get calls from students looking for their credential within a few weeks.

PLEASE MAKE SURE WE HAVE VALID EMAIL FOR THE STUDENTS as that is the identification for their online credential.

The FOA maintains a database of every person holding FOA certifications. Students will receive renewal notices on their certifications each year.

## Administering FOA Exams

- School assigns a FOA certification ID number
- Format XXXYYYY
- XXX = school number
- YYYY = student number, sequential from 0001
- Schools give the students a certificate of completion for the class – FOA will follow by creating online credentials for them (see later)
- Keep records of your students for several years
- You can always call FOA to find out your latest number if you lose track of them

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47

Schools should give the students who pass a certificate that shows they completed the class and passed the exam– FOA creates online credentials . You can download certificate templates from the instructor website.

Each school should retain a completed application form for each student that passes the exam and submit the application form spreadsheet to cover all students. Please do it within a few days after the end of class, as we get calls from students looking for their credentials within a few weeks.

Create your own certificates but add the FOA logo on the template.

**PLEASE MAKE SURE WE HAVE VALID EMAIL ADDRESSES FOR THE STUDENTS.** Inform them they will receive an online credential from us within 4-6 weeks (depends on how fast you get the info to us) and they must keep us informed of email address changes.

Students will receive renewal notices on their certifications every 3 year.

## FOA Online Credentials

- Certified techs receive an email with a link to an online certification credential
- They share the link to show they are FOA certified
- They can print a certificate too
- Works great with smartphone
- Interfaces with social media (LinkedIn, Facebook, etc.)



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48

FOA now provides all certified techs with an online credential. It includes a webpage that shows their certifications and FOA certification number. This online credential also allows sharing on social media and printing a certificate. It works great with all kinds of devices, PCs, Macs, tablets or smartphones.



The Fiber Optic Association certifies instructors. This is the PowerPoint presentation we use for our TTT classes. It's annotated so all instructors can use it to take the same class: it also allows anyone reading it to get practically the same information that they would get attending the seminar.

So go through this presentation. Read all the comments in the Notes carefully as you look at the slides. We think you will get the gist of our seminars and will prepare yourself for the FOA Instructor Certification exam.

If you have questions, contact us at [info@foa.org](mailto:info@foa.org).

## FOA Certified Instructors

- FOA Certified Instructors must be sponsored by an FOA Approved School and teach for them only.
- Must have skills and knowledge to teach classroom sessions and hands-on labs
- Instructors must pass initial instructor exam CFOS/I or CPCT/I
- Instructors must pass certification exams for all additional courses they teach
- Must follow FOA rules for use of course materials, confidentiality, etc.

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50

Requirements for instructors to apply for CFOS/I certification include being sponsored by an FOA approved school, submitting a resume for FOA approval and passing the CFOS/I or CPCT/I instructor versions of the CFOT or CPCT certification exam. Since they must also teach hands-on labs, they must have the skills to teach the labs. If they do not have field experience, the instructor candidate may be asked to take a course from an FOA school to learn the skills as well as see how an FOA certification course is given.

Instructors will have access to the FOA curriculum which includes copyrighted proprietary material which has limits on its use. Instructors will agree to abide by these usage rules to protect FOA intellectual property.

## Instructors

- Instructors must be knowledgeable about what they teach, measured by passing the instructor exams for any and all certifications they teach
- CFOS/I exam includes the CFOT, CPCT/I exam includes CPCT
- Instructors must have skills and knowledge to teach lab sessions during hands-on labs
- Ideally, instructors have some field experience

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51

Rules for instructors. Instructors who pass the Instructor exam will get a CFOT and a provisional instructor certification (IP). Instructors who pass the CPCT/I exam will get a CPCT and a provisional instructor certification.



## CFOS/I Instructors

- Instructor applicants must fill in application online
- FOA Certified Instructors must sign instructor agreement, covering conditions required for use of FOA materials
- Comply with Instructor Code of Conduct
- Remain active as an instructor – submitting certifications each year
- This – and more – are covered in the FOA School Handbook

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52

Requirements for instructors to apply for CFOS/I certification – a summary.

## What Does An Instructor Need?

- Training as an instructor
- Technical knowledge
- Skills
  - Technical
  - Organization
  - Communication (2-way)
  - Presentation
  - Hands-on for labs



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53

A good instructor is first a good student. They will have gotten a good education as a teacher as well as technical knowledge in fiber optics and cabling. Knowing the technology and its practice is not enough. An instructor must be able to organize a course, communicate with the students - in both directions, be able to run an interesting, informative class and teach labs by example.

Teaching a class on any subject can be done by any experienced instructor, as they are used to digging into new topics and learning it well enough to teach it to others. But labs can be a bigger challenge, as it's necessary to have skills as well as knowledge. Thus fiber optic instructors need to be familiar with all the tools and processes used for installation, a familiarity that comes only with training and practice.

## Duties of Instructors

- Teach the course, of course
- Keep up to date (will be tested at renewal)
  - Fiber optic technology and products
  - FOA resources and procedures
- Take certification exams for all courses they teach
- Introduce the students to the FOA using FOA PPT or pass out the FOA brochure
- *Sign up for the FOA email newsletter – see the FOA home page for link to sign up*

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54

These are the duties of every instructor. Sign up for the FOA Instructor eMail list to keep up to date.

## Duties of Instructors

### Teaching FOA Certification Courses

- Introduce the students to the FOA
- Teach the course following FOA KSA guidelines
- The instructor who teaches the class must sign the student applications. Never office staff!
- Judge the abilities of the students – the instructor must sign off on the students' hands-on skills in labs
- Complete FOA paperwork and submit to the FOA promptly (here the staff can help!)



These are the duties of every instructor.

## Duties of Instructors

### Curriculum For FOA Certification Courses

- When you become a certified instructor; you will be given access to the FOA School Download Site
- You can download curriculum materials, guides, student applications for use in developing your courses and all exams
- Check this site regularly – before each class. FOA updates curriculum and other materials often to keep up with the industry
- You will be placed on the FOA Instructor email list – read the emails!

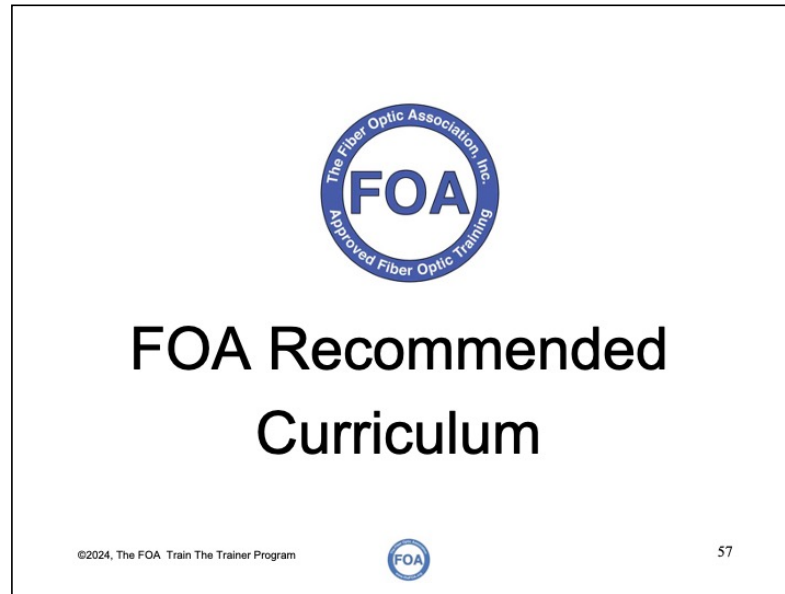
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56

These are the duties of every instructor.

Sign up for the FOA Instructor eMail list to keep up to date. It's how FOA communicates with its schools and instructors.



FOA recommended curriculum

## The FOA Fiber Optic Curriculum

- FOA provides free curriculum to approved schools which follows the FOA KSAs
- The FOA provided curriculum may be used or school/instructor may develop their own as long as it covers the FOA KSA and course guidelines
- FOA curriculum may (should!) be expanded by instructors to include more materials such as specific applications information or manufacturer's data on components or systems
- FOA updates curriculum regularly so check the download site before teaching a new class!

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58

FOA provides curriculum which follows KSAs free to approved schools

FOA provided curriculum may be used for teaching certification classes or the school or instructor may develop their own as long as it prepares the student for FOA certification exams based on the KSAs and reference materials.

FOA provided curriculum may be expanded by instructors to include more materials such as applications information or manufacturer's data on components, equipment or systems

## The FOA Fiber Optic Curriculum

- What Is In A Good Basic Class?
  - The basics of fiber optics
  - Applications
  - Components
  - Installation
  - Testing
  - Hands-on exercises
- **Safety in every session!**
- Relevant standards and codes
- FOA textbooks are organized this way

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59

Our experience is that many if not most students are starting from scratch. They have little knowledge of fiber optics and no experience. That means that the instructor must concentrate on presenting the basics of fiber optics in a non-threatening manner.

Since we started teaching fiber optics over 35 years ago, we've used this same basic curriculum, keeping it up to date for new technology.

We start with the basics of how fiber transmits light,

1. how fiber optics is used in communications,
2. fiber optic components
3. how installations are done,
4. how they are tested,
5. and intersperse the classroom lessons with hands-on exercises.



## The FOA Fiber Optic Curriculum

- What Is NOT In A Good Basic Class?
  - Basic geometric optics – has no relevance to a fiber tech, only to engineers and scientists or designers of lenses
  - Installation and operation of most kinds of communications equipment – techs learn this from manufacturers – FOA focuses on the cable plant, its installation, testing, operation and restoration (repair)
  - Heavy equipment used in construction – we leave that to the construction people.

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60

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Heavy equipment used in construction – we leave that to the construction people.

## The FOA Curriculum Covers Standards

- Why do we have standards? Standards make things work!
- Different between standards and codes or laws
- Organizations: TIA/EIA, ISO, IEC, FOA
- Standards cover:
  - Components (fiber, cable connectors)
  - Test and measurement
  - Networks
  - Terms, definitions and symbols



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61

Widespread usage of any technology depends on the existence of acceptable standards. Users prefer to invest in standard solutions to problems, as it promises interoperability and future expandability. Standards must include component standards, network standards, installation standards, standard test methods and good calibration standards. Standards also include safety, as covered in the National Electrical Code, the only mandatory standard most cable installations must meet.

These standards are developed by a variety of groups working together. Network standards come from Telcordia (formerly Bellcore), ANSI (American National Standards Institute), IEEE (Institute of Electrical and Electronic Engineers), IEC (International Electrotechnical Commission) and other groups worldwide. The component and testing standards come from some of these same groups, plus the EIA/TIA (the merged Electronics Industry Association and Telecommunications Industry Association) in the US, internationally from the IEC, ISO (International Standards Organization) and other groups worldwide.

Most of the fiber optic standards in the US are handled by TIA, in the FOA committees for components and TR42 for premises cabling, now operating under one group under TR-42.

## The FOA Curriculum Covers Standards

- FOA is a participant in US and international standards committees
- Standards are covered in all curriculum, explaining:
  - What they mean
  - Where they apply
  - How to use them
- FOA training also covers codes like the National Electrical code

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62

Standards are mandatory to ensure communications networks work together and fiber optic components, cable plants and networks must meet industry standards. FOA curriculum covers standards in every aspect of fiber optics. FOA has been a participant in US and international standards committees for many years to ensure we understand the standards but also to make our voice heard in developing them properly, FOA also covers codes like the National Electric Code.

## The Basics

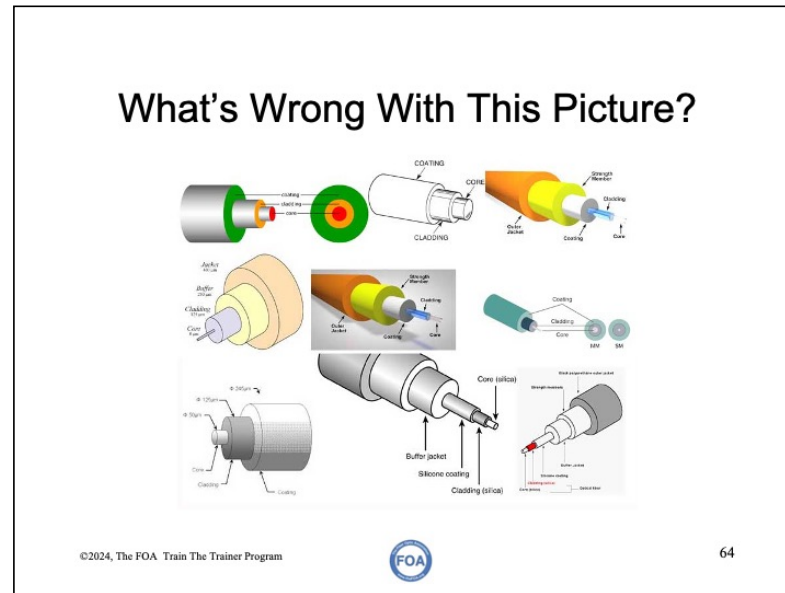
- How fiber works
  - Guided light in fibers  
(optional: college level courses may include some optics with math)
  - Types of fibers  
(multimode, singlemode)
  - Fiber specifications  
(geometry, attenuation, bandwidth)

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The depth of coverage of basic fiber optic theory depends on the students. Non-academic installers get a quick overview. High school students about the same. But the coverage gets deeper for technical and academic college students.

One thing everybody wants to know is how fiber is made. How such a small fiber can be made in such high volume with such performance must seem magical to most people. FOA has pages on how fiber is made in the Online Guide. For your class, you may want to get a copy of one of the videos made about how fiber is made. Contact Corning or OFS for theirs.

“Sufficiently advanced technology is indistinguishable from magic.” Arthur C. Clarke



Go back a slide and look at the drawing of a fiber. Note how the fiber core and cladding are shown as one part while the drawings above show the fiber core sticking out of the cladding? FOA wondered why 25% of all students missed the question "What do you strip when you strip fiber? 1 out of 4 answered "the cladding" instead of the buffer coating! Since the core and cladding are one solid piece of glass, that's impossible. But those missing the question told us that every drawing they saw of a fiber (except at FOA!) showed the core sticking out of the cladding so they assumed you could strip the cladding. Make a point of this to your class so they don't miss that question on the certification test!

See <https://foa.org/2018update.html> in the FOA Guide.

## How Fiber Optic Links Work

- Transmitter
  - Sources - LEDs and lasers
- Receiver
  - Detectors - PINs and APDs
- Duplex transmission
- Power and loss budget
- Bit Error Rates (BER)

The diagram illustrates a fiber optic link. On the left is a transmitter box containing two yellow circles representing LEDs or lasers. On the right is a receiver box containing two yellow circles representing detectors. Two black lines representing optical fibers connect the transmitter to the receiver. Below this is a graph with 'Bit-Error Rate' on the vertical axis and 'Receiver Power' on the horizontal axis. A red curve shows the BER decreasing as receiver power increases. A green shaded area between the curve and the axes is labeled 'Operating Range'.

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FOA

65

If you are going to install and troubleshoot systems, not just cable plants, of course you need to know about the components of data links. But similarly, if you are designing and testing links, you need to understand power and loss budgets, so an overview of how links work is good background information.

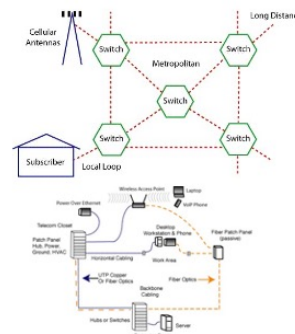
Students need to know how transmitters work - converting electrical signals, either analog or digital, to optical signals using LEDs and lasers, including devices like DFB lasers and VCSELs.

Receivers do the opposite of transmitters, converting optical signals to electrical ones. How well a link works depends on how well the link recreates the electrical input of the transmitter to the output of the receiver.

The power budget is how much loss the link can sustain, a function of the output power of the transmitter and the sensitivity of the receiver. This is measured by the BER or bit error rate of the link, which is directly a function of receiver power and link loss, loss budgets.

## Applications - Networks

- Telecom
  - Long haul, Internet, wireless backhaul, DWDM & Fiber Amps, FTTH PON
- CATV
  - AM vs FM vs Digital, HFC
- LANs
  - Ethernet, OLANs
- SANs
  - Ethernet, Fibre Channel



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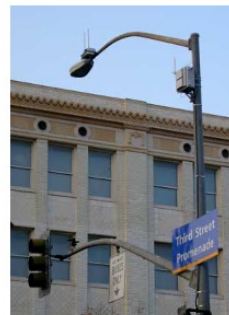
66

Where is fiber used? Well, about everywhere in communications including wireless, and even installers should be familiar with the typical applications. The FOA PPT has examples of many fiber applications that students find interesting, from telecom to finding the Titanic. Especially, they should know the difference between outside plant and premises installs.

FOA offers specialist courses on applications like fiber to the home (FTTH), fiber for wireless, optical LANs and data centers.

## Applications - Links

- Video
  - Security (CCTV), CATV, remote large screen video monitors
- Industrial Links
  - Ethernet, RS-232, RS-422
- Wireless Antennas, DAS
- Utility grid management (Smart Grid)
- Overview: sensors and lighting



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67

Security is a hot item right now, as are industrial links and cabling to support wireless (which is by no means wireless-access points require cable connections!)

It is good to cover them all and give a little background, so even the installer can discuss the work intelligently with the customer.

Video links on fiber can be analog (AM or FM) or digital. Most public buildings have extensive surveillance networks and many cameras are on fiber due to the cost and limited length supported by COAX cable. Broadcast TV (CATV) we're already discussed above. Another big use of fiber optics is the large screen monitor used in sports arenas, advertising signs (e.g. the "Strip" in Las Vegas.)

Industrial applications have used fiber for its immunity to EMI (electromagnetic interference) for a long time. Now Ethernet is widely used in industrial applications today, and much of the cabling is fiber to support longer lengths than a typical office LAN as well as due to its immunity to EMI.

If you look at how wireless antennas are connected to the network equipment for cell phones or wireless LANs, you will find cable and often that cable is fiber optics.

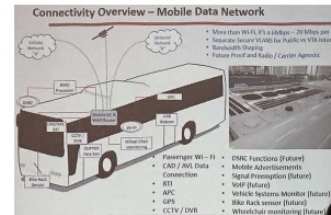
Utilities use fiber to control their grid and provide network-wide communications. Fiber's EMI immunity even allows running fiber inside the high voltage distribution cables.

Fiber can make very sensitive sensors. FO acoustic sensors in the oceans listen for submarines. Sensors measure the current in high-voltage distribution lines. Installed outside plant fiber optic cables are even used as seismic sensors for earthquake warning systems.



## Applications

- Intelligent highways, smart vehicles
- Traffic monitoring and control
- Smart lights
- Municipal CCTV
- Fire and life safety



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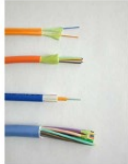



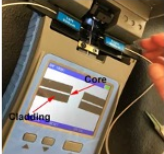
68

Metropolitan networks for intelligent traffic systems, cellular small cells, video surveillance, etc. are a hot topic today. All use fiber.


## Fiber Optic Components

- Fiber
- Cables
- Connectors
- Splices
- Hardware (installation hardware, patch panels, splice closures, conduit and innerduct, etc.)



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69

Everyone needs to understand the types of components that are merged into a complete cable plant.

You need to cover all the types of cables and where they are used. Samples will help them remember the differences among types. Manufacturers can supply lots of samples.

Connectors need to be covered two ways: first by design (ST, SC, LC, MT-RJ) and secondly by installation method (epoxy/polish, anaerobic, Hot Melt, prepolished/splice, etc.)

Splices don't just require explanations of what they are (fusion vs mechanical) but also where each is used and why.

All the rest of the hardware is important too: patch panels, splice closures, racks, innerduct, etc.

Remember a picture is worth a thousand words, maybe more if you have a sample to pass around.

## Fiber Optic Network Design

- Safety
- Standards
- Code compliance
- Creating prints and specs
- Planning
- Documentation



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70


Before a fiber optic network can be built, it must be designed. FOA certification programs all contain some information on design, but FOA has a Fiber Optic Network Design certification (CFOS/D) also.

## Fiber Optic Installation

- Safety
- Reading prints and specs
- Tools
- Pulling/preparing cable
- Splicing and termination
- Cleaning
- Testing
- Documentation



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71

Be sure to cover safety thoroughly, including installation safety and what you require in the lab, before starting any hands-on exercises. And be sure the instructor - that's you - follows the rules too!

Everybody needs to know the difference between standards (voluntary) and codes (legal).

The rest of the material can be scaled to the aim of the class.

## Outside Plant vs Premises



**In fiber optics, outside plant and premises applications are different and training should reflect the students' interest**

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72

Fiber optics is not all the same. Outside plant refers to fiber optics as used outdoors in telephone networks or CATV. Premises fiber optics is used in buildings and on campuses.

**Outside Plant:** Telephones, CATV, wireless phones, and the Internet all use lots of fiber optics, most of which is outside buildings. It hangs from poles, is buried underground, pulled through conduit or is even submerged underwater. Most of it goes relatively long distances, from a few thousand feet to hundreds of miles, over singlemode fiber.

**Premises Cabling:** By contrast, premises cabling involves cables installed in buildings for LANs or security systems. It involves short lengths, rarely longer than a few hundred to two thousand feet, of mostly multimode fiber.

Both these applications are unique in the components they use, the installation methods and the testing procedures, but they share many of the basic principles we learn in any course.

## OSP vs. Premises

- OSP cables are rugged, designed for long pulls, burial or aerial support
- Survive harsh environments
- Mostly SM
- Fusion splicing common
- Test with OLTS and OTDR
- Cables must be fire-retardant
- Mostly MM but also SM, UTP & coax copper
- Terminate fibers directly with connectors
- Not much splicing
- Test with OLTS, OTDR rarely

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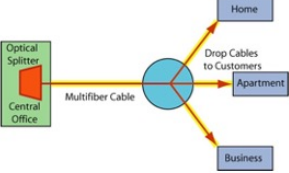


73


The differences in OSP and premises cable plants mean that training programs for each are quite different. OSP training needs to include cable preparation using typical OSP cables, including loose tube, ribbon and armored types. All OSP techs need to be familiar with fusion splicing and OTDR testing – in addition to OLTS insertion loss testing.

Premises techs need to know the special types of premises-rated cables and how to deal with code issues like firestopping. These techs must also learn how to terminate fibers directly, the way premises fiber optics are usually done. Testing is mostly OLTS but students must be introduced to the OTDR and learn where its use is appropriate. For the FOA CPCT premises cabling certification, students must also learn UTP and coax cable termination.

## Fiber To The Home Networks

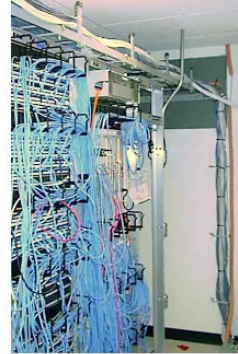
**GPON - passive optical networks using splitters**

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Fiber To The Home (FTTH), Fiber To The Premises (FTTP) and Fiber To The Curb (FTTC), often simply referred to as FTTx, has become a reality. Now telcos, private service providers and even town and homeowners associations are hiring thousands of technicians to install FTTx to literally millions of homes each year. It's some OSP, some premises, with technology and components evolving rapidly. The FOA offers CFOS/H certification and CPCT for FTTH with the input of many of the installers and users of FTTx.

## Premises Cabling

- Includes LANs, data centers, security systems, building automation and more
- Combines fiber, copper and wireless
- FOA CPCT certification requires knowledge and installation skills in all three



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75

Premises cabling involves all the communications devices installed indoors – LANs, video systems, DAS for indoor wireless, security systems, building automation systems, etc.



## Testing

- Continuity, tracing and visual fault location – cleaning every step
- Visual inspection with a microscope
- Insertion loss with meter and source
- OTDR testing splices and cable plants
- Fiber characterization/ long haul testing (CD, PMD, SA)
- Troubleshooting



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76

Testing is the key to knowing the job was done right so knowing how to test correctly is vitally important. All the tasks should be demonstrated and students should be assigned exercises to learn by doing. Testing their own terminations and splices are a good way to teach testing and show them how well they are doing in the process.

Students must be taught that all link standards require insertion loss testing with a source and power meter or an OLTS. In addition, microscopes can find bad or dirty connectors and visual tracers or fault locators can locate fibers or find some problems. OTDRs are necessary to verify splice loss in outside plant installations and can be useful in troubleshooting problems, unless the cables are too short like in most premises cabling networks.

FOA also has a comprehensive course on fiber optic testing for CFOS/T certification.

## College or Technician Level?

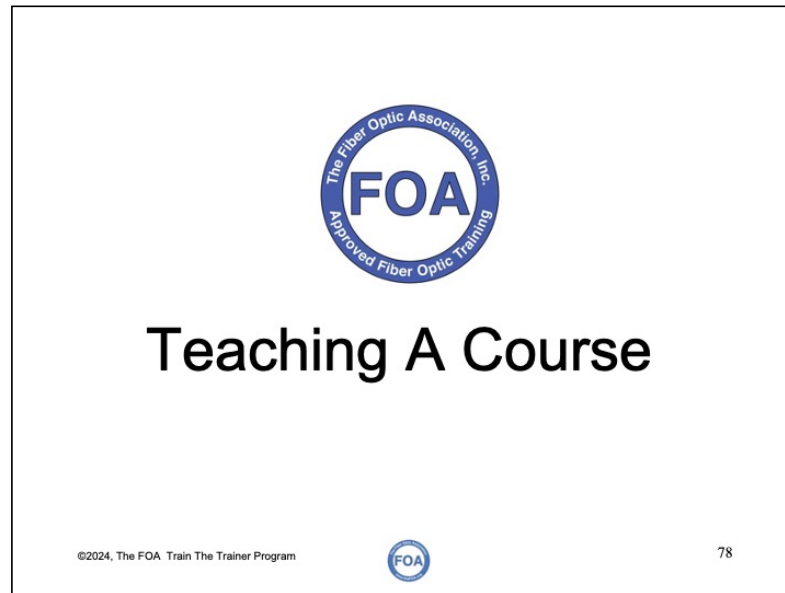
- **Academic/College Courses – not FOA!**
  - For engineers and researchers - theory a good background in the technology- including optics
- **Technician/Certification Courses – that's FOA**
  - Basics and skills practice - concentrate on developing skills
- **Labs reinforce classroom appropriately**

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77

The depth of any course depends on the students and the goals of the class. College-level classes, of course, cover the background theory so students can advance to higher levels, perhaps even developing new technology. Technician level courses like the FOA certification courses focus on developing knowledge and skills appropriate for the installation and maintenance of such networks - forget the optics and stick to the basics, components, installation, testing and troubleshooting. Labs are likewise oriented, with college labs focusing on teaching the physics of the phenomena, while a tech's class is to develop skills in cable installation, termination, splicing and testing.



Here is what FOA and it's advisors have learned in 40+ years of teaching fiber techs and certifying almost 100,000 techs with 130,000 certifications at FOA.

## Starting A Basic Fiber Optic Course

- Set realistic goals to meet student needs
- Have complete lesson plans
- Curriculum materials - textbooks, presentation slides and notes, references and resources
- Lab Setup, equipment and materials

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79

Goals are the place to start.

1. What is the class trying to accomplish?
2. What material and labs need to be covered to reach those goals?
3. What do you and the students need for materials in the classroom and for homework?
4. How do you set up a lab that facilitates learning?

Let's look at this in more detail.

## Introducing KSAs

- KSA = knowledge, skills, abilities
  - Knowledge will come from the classroom
  - Skills come from labs
  - Abilities are mostly innate
  - Go to <http://www.thefoa.org/KSAs.html>
- All students are different
  - Come in with different abilities and prior knowledge
  - Learn at different rates in different ways

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80

It is very important for a technical trainer to understand KSA and recognize the differences in students.

KSA = knowledge, skills, abilities

Knowledge will come from class - although each student brings some prior knowledge to class

Skills come from labs - they will develop basic skills in labs and develop more advanced skills on the job

Abilities are mostly innate - each student has different abilities. Fiber optics requires fine motor skills, steady nerves and patience! Some students seem to not have those abilities and can try the patience of the instructor, but keeping exercises that require good hand-motor skills well organized and broken into small steps will help all students learn faster.

All students are different and come in with different abilities and prior knowledge

Learn at different rates in different ways

Try to evaluate all students, recognize this and if possible, pair students who have problems with those who are more skilled or learn faster so they have a tutor!

## Realistic Goals

- What is the student expected to master? KSAs
- What tasks are to be performed?
- Every student's ability is different - learns in different ways and at different rates
- Is the schedule realistic?



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81

Success in a course means you must start with realistic goals.

In a typical technician course, they should finish with a good knowledge of the basics of fiber optics plus they must know where to find out the details they didn't learn or will invariably forget.

They need to develop some basic skills they can take into the field, adequate for success in OJT. This includes cable handling, installation and preparation, termination, splicing and testing.

Perhaps the hardest task for the instructor is creating a lesson plan and class schedule that can accommodate students of varying abilities working speeds. It's always necessary to be flexible and adjust the rate to keep the best students interested and not let the slowest students get behind.

## Realistic Goals

- What is the student expected to master?
  - Knowledge - technology, applications, components, installation, test
  - Skills - pulling and prepping cable, splicing, termination, testing and troubleshooting
- Abilities: hand-eye coordination, not color-blind, basic reading, writing, math, etc.
- FOA programs have been rated at a 10<sup>th</sup> grade learning level.

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82

This should be part of the instructor's planning process and it should also be communicated to the student at the beginning of the course.

The course should have firm goals of the knowledge expected that each student will learn: basic fiber optic technology, applications like telecom, CATV, LANs, security, etc., all the components that comprise a fiber optic cable plant, and finally how those components are installed and tested.

Beyond that knowledge, the student should learn the basic skills in hands-on labs: how fiber optic cable is installed and prepared for termination and splicing, the processes of termination and splicing, and finally testing and troubleshooting.

Worth discussing: What if the student appears to not have the abilities needed?

## Realistic Goals

- What tasks are to be performed?
  - Classroom - learn from presentations and participate in discussions (prep for certification test)
  - Homework - outside assignments from textbook, web, etc.
  - Hands-on labs - cable handling, termination, splicing, testing, troubleshooting – learn basic skills (instructor signs off that student has achieved proper skills)

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83

Goals must be communicated to the student so they are prepared for the experience. It sets realistic expectations.

Besides classroom presentations and hands-on exercises in labs, the student should be given outside assignments, even in a short seminar environment, that reinforces the classroom or lab work. Use the FOA text, The Fiber Optic Technicians Manual, trade magazine articles, or the Internet, where you can find resources like Lennie Lightwave's Guide To Fiber Optics at [www.LennieLightwave.com](http://www.LennieLightwave.com) or the Tech Topics on the FOA website to have the students research particular topics that are not covered in detail in class. If time permits, require the students to do a short summary of their assigned work for the other students.

Practically speaking, classroom is where the student gets the basic knowledge they will be tested on in the FOA certification test and the lab is where they learn the skills and the instructor observes their work to ensure they learn properly.



## Realistic Goals

- Every student is different - learns in different ways and at different rates
- Cover materials fast enough to keep faster students interested but don't lose the slower ones
- Pair faster or experienced students with opposites, especially in labs
- Is the course schedule realistic?

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84

Juggling the different rates that students learn is one of the most difficult issues. Sometimes pairing slower students with faster ones can help, as you provide a tutor for the slower one, especially in lab exercises. Each time you give a class, you will learn more about how to pace yourself.

## Lesson Plan

- **Level** \_\_\_\_\_ **Subject** \_\_\_\_\_
- **Prepared By** \_\_\_\_\_
- **Overview & Purpose** What will be learned and why it is useful.
- **Education Standards Addressed** What state/county/educational /INDUSTRY standards that this lesson satisfies.
- **Teacher Guide** \_\_\_\_\_
- **Student Guide** \_\_\_\_\_
- **Objectives** (Specify skills/information that will be learned.)
- **Materials Needed:** Text, Paper, Pencil, Others
- **Information** (Give and/or demonstrate necessary information)
- **Verification** (Steps to check for student understanding)
- **Other Resources**(e.g. Web, books, etc.)
- **Activity** (Describe the independent activity to reinforce this lesson)
- **Summary**
- **Additional Notes**

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85

A lesson plan is an overview of the course, showing the purpose of the course, references to be used, objectives of each lesson covered, activities involved in that lesson and how learning is verified.

Lesson plans are important as they keep class on tasks and on time. The lesson plan changes with audience too.

Here is a sample lesson plan. In the next slide, let's fill it in for a fiber optic course.

## Lesson Plan - First Session-Basics

- **Level** Basic **Subject** Fiber Optic Technology
- **Prepared By** Instructor
- **Overview & Purpose** To learn the basics of fiber optic technology to prepare for more advanced topics.
- **Education Standards Addressed** What state/county/educational /INDUSTRY standards that this lesson satisfies.
- **Teacher Guide** The FOA Reference Guide to Fiber Optics
- **Student Guide** Lab Handbook
- **Objectives** Learn how fiber works, how networks use it for transmission
- **Materials Needed:** Text, Paper, Pencil, Others
- **Information** (Give and/or demonstrate necessary information)
- **Verification** (Steps to check for student understanding)
- **Other Resources** (FOA Online Reference Guide, Lennie Lightwave)
- **Activity** Pass around sample of fiber to see how it "pipes" light
- **Summary** Covers chapters 1,2 FOA Reference Guide
- **Additional Notes:** Bring fiber samples to class

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86

Filled in with some details for a fiber optic course.

## Classroom Materials

- Textbook or FOA Online Reference Guide
- Handouts for presentation (PPT slides with notes)
- Outside reading (books, magazines, websites)
- Online exercises for blended learning
- What are students expected to bring to class? (paper, pencils, calculators, textbooks, etc. – or laptops and tablets)
- Teachers demonstration gear (samples of cable, connectors, splices, etc.)

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87

Since the FOA CFOT exam is based on the textbook, The FOA Reference Guide to Fiber Optics, *it's best if each student has a copy of the book. The handout you give them at the beginning of class should spell out what other materials are going to be used and give URLs for websites or copies of articles from journals, trade magazines, etc.*

*We highly recommend that all presentations, generally done in PowerPoint, be annotated. FOA uses the notes section of PowerPoint to explain what the slide means - just like we are doing here - and you can print a copy of the slides with notes for each student to use to follow the presentation and make notes on the printed copy. Or give them a copy of the pdf file for their computer or tablet.*

*Tell students at the beginning of class and at the end of each day what they are expected to bring to the next class - and what the topic of the class will be.*

*Any fiber optic instructor should try to accumulate a set of samples of fiber optic components - connectors, cables, splices, splice closures, etc. to show students. You can get them from salespersons, companies at trade shows, or by calling manufacturers. Videos and other training aids are usually available for instructors too.*

## Slide Presentations

- Slides should be concise and clear
- Keep text **large** for easy reading
- Photos should be large and clear
- Use notes to explain what the slide means
- Printout slides one per page with notes
- Allow plenty of room for students to make notes on the printout

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88

*Note that FOA slides use large type and simple summaries of the points being made on that slide – the instructor’s job is to explain the points not read the slides! We highly recommend that all presentations, generally done in PowerPoint, be annotated. Use the notes section of PowerPoint to explain what the slide means - what points you are trying to get across to the students - just like we are doing here - and print a copy of the slides with notes for each student to use to follow the presentation and make notes on the printed copy.*

*NOTHING is more annoying than to get a page with 5 slides per page of slides with small type so nothing is easily read!*

## Lab Setup

- Lab tables - spacious for two students
- Equipment- tools and test equipment shared by two
- Consumable supplies - cables, connectors, splices, adhesives, polishing film, etc.
- Students work in pairs, share equipment



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89

Setting up a lab is time consuming and potentially expensive. We always recommend that students work in pairs to help each other. They need at least 6 feet (1.8m) of lab space to work in and a full complement of tools and test equipment. It helps to keep tools in kits for a pair of students, arranged so that each tool has a place to be stored and each kit has a checklist of the contents. Test equipment is not cheap, but classes work better when each pair of students have their own power meter and source, as passing equipment around a class is disruptive, slows down the process and may be damaged. The consumables you need for a lab depend on what types of components your class focuses on, but we suggest pre-packaging the consumables and keeping spares to dole out as needed to prevent waste.

## Lab Setups



Examples from a TTT course  
(note black work mats – they  
make it easier to see fibers)

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90

Lab setups vary according to the lab focus. Working on black mats makes seeing fibers easier – especially fiber scraps which need to be discarded safely. A lab station should have all the tools for that lab and consumable components like cables or connectors ready for the students. Building toolkits for each pair of students – with a parts list – helps organization and keeping track of tools.

Note the black work mats on the tables at each workstation – the black background makes it easier to see fibers and find fiber scraps dropped on the table.

## Safety Rules

- Read and follow rules in lab manual and show the FOA YouTube Safety Lecture
- Everyone must wear safety glasses – **including the instructor!**
- Work on dark surface to help spot fiber scraps
- Have first aid kit and eye wash station available



*See lab manuals for more safety rules*

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91

Safety must be the #1 concern of the instructor and students. In class, students will work with tools, components and chemicals that require careful handling. All students – and the instructor - must wear safety glasses to protect their eyes. Fiber scraps must be disposed of properly. Alcohol is used for cleaning and it is flammable! Refer to the lab manuals or the FOA safety PPT for more details – and include that PPT in every class!

Fiber Optic Installation Safety Rules are on the FOA website in Tech Topics: [www.thefoa.org/tech/safety.htm](http://www.thefoa.org/tech/safety.htm) and on the FOA YouTube channel

**REMEMBER: THE INSTRUCTOR MUST FOLLOW THE RULES TOO! WE HAVE SEEN INSTRUCTORS NOT WEARING SAFETY GLASSES AND DUMPING FIBER WASTE INTO WASTEBASKETS. FOLLOW THE RULES YOURSELF!**



## Safety Rules

- Dispose of fiber scraps carefully – every one! – in a disposable container
- Be careful with chemicals
- No eating or drinking
- Properly clean up after class and dispose of scraps carefully



*See lab manuals for more safety rules*

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92

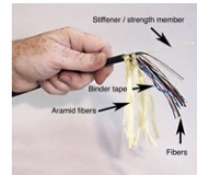
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## Fiber Is More Than Splicing

- Most people teach splicing
- Most teach termination (OSP)
- Cable handling and preparation is vitally important
  - Identify types of cables
  - Cable pulling
  - Cable stripping and prep



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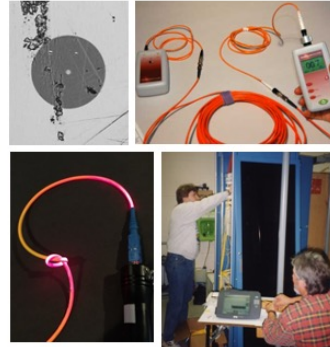
93

Many fiber techs like to call themselves “splicers,” but fiber installation is more than splicing. It is impossible for an installer to successfully complete an installation without knowing how to pull cable and prepare the fibers for termination or splicing. Everyone teaches termination and most teach splicing, but every fiber optic tech must know how to handle cable and expose fibers for termination and splicing in order to do it successfully. Thus we strongly recommend that every class include a lab on handling cable and fiber. The student should learn to identify each type of cable (simplex or zipcord, distribution, breakout and loose tube), how that type of cable is installed or pulled, and how to expose the fibers.

Testing is another topic of great importance but should be tailored to the audience, e.g. OSP gets lots of OTDR training while premises techs get only an OTDR intro.

## Testing Is Vitally Important

- Biggest problem with installations
- Visual connector inspection
- Tracing/polarity
- Insertion loss
- OTDR
- Specialty testing



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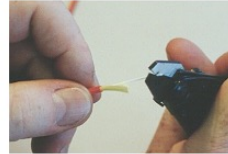


94

How do you know an installation is done properly? You test it! How you test it may depend on the type of installation. All installations involve visual inspection of connectors for cleanliness and scratches. Outside plant installations are always tested with an OTDR while premises cabling is usually just tested with a power meter and source. The whys and hows are explained in the FOA courses. The instructor needs to understand what gets tested by which instrument and what the results should be (the loss budget.)

## Lab Tools and Test Equipment

- Hand Tools
  - Cable prep
  - Splicing
  - Termination
- Test equipment
  - Visual fault locator
  - Connector inspection microscope
  - Light source and power meter
  - OTDR
- FOA has lists of tools and deals with vendors



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95

You need quite a few tools and equipment for students. What you need depends on your lesson plan. FOA can provide comprehensive lists of tools for various labs and suggest sources to supply them.

Instructors tell us that some students lack familiarity with basic hand tools so you may have to be patient and help them learn in the labs.

## Consumable Supplies

- Cable to prepare, splice and terminate
- Splice protectors and closures
- Connectors
- More depending on the course
- Safety equipment
  - Scrap disposal bins
  - Safety glasses



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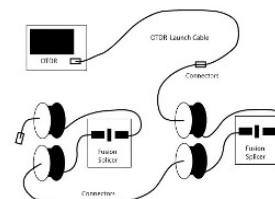


96

Your consumable lists will depend on the components you are using and the processes you are teaching. Remember to have available a disposable scrap bin (we used deli soup cups with lids) for each pair of students. You might as well consider safety glasses as consumable as they get broken, scratched or lost with great regularity.

## Fusion Splicing Lab (OSP)

- Should include
  - several spools of fiber
  - several fusion splicers
  - OTDR to verify splices
- Can combine single and ribbon splicing stations
- Students work in groups and rotate among stations
- Add SOC termination



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97

The ideal way to teach a splicing class is to have several long spools of fiber, several fusion splicers to concatenate a long link, and one OTDR to test the splices as they are made. (In the field, techs doing splicing are usually accompanied by a test tech with an OTDR to verify each splice as it is made, before it is closed up inside a splice case.) This setup accommodates three sets of students, 2 or 3 at each station who each do several repetitions and then moves to the next station. Using one of the links for ribbon and one for single fibers is idea. FOA has a source for bare fiber on spools for splicing labs – contact FOA.

## Splice-On Connectors (SOC)

- Factory-polished with fiber stub
- Use instead of pigtails
- No splice closure
- Inexpensive
- Fast and easy to install too!



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98

Splice-On Connectors (SOC) has become one of the most popular termination processes and are ideal for a class as termination lab is combined with the splicing lab. The connector has a pigtail that is prepared like the other fiber and spliced directly on to the fiber. Easy. Inexpensive especially with the new generation of low-cost portable splicers. This is taking off in all applications and is recommended for training. Some instructors use SOC's with mechanical splices, also OK, but they are more expensive per connector than fusion SOC's.

## “Cat 5” UTP Termination

- For premises cabling courses (CPCT)
- Create training aids like these termination boards which can be transported or build a room like a telecom room



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99

If you have a permanent classroom, make it look like a real customer location. Or build a tabletop training board to teach UTP termination.



## Hints For Teaching The Course

- Getting started
  - Introduce yourself (name, what you want to be called, background) and the FOA
  - Give students handouts, notes, etc.
  - Present goals and rules for class
  - Review class schedule, activities
  - Discuss class materials, assignments, outside projects, etc.
  - **Talk about safety. Pass out safety glasses and discuss installation safety!**

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100

Set the stage for a good session. Everybody should get to know each other first. Then you need to explain the goals for the class and what topics will be covered and in what order. Cover all the materials and assignments for the whole session and review that and the schedule daily.

Finally - before you start class - and before you start any hands-on exercises - cover safety!

Fiber Optic Installation Safety Rules are on the FOA website in Tech Topics: [www.thefoa.org/tech/safety.htm](http://www.thefoa.org/tech/safety.htm) and on the FOA YouTube channel

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## Hints For Teaching The Course

- Use various presentation methods:
  - Lecture - PowerPoint or other slide programs or draw on boards
  - Demonstration
    - Pass around samples
    - Show how things work
    - Demo lab exercises – before you start the labs
  - Use various media - slides, video, web
  - *Learn to communicate effectively*

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101

Sometimes keeping everyone interested is the hardest part of teaching. Variety and lots of hands-on activities helps. Being a good communicator (anyone can learn how - and asking for feedback continuously helps.)

Most instructors use PowerPoint for their presentations, but be realistic. You need to avoid being dull, but too many PPT presentations are too cutesy - with fancy dissolves between slides and bright backgrounds. Keep it simple most of the time!

Do lots of demonstrations and have lots of samples to pass around. Remember Mr. Wizard?

Communicating effectively means don't stand stiffly in front of a class and lecture in a monotone - see the next slide.

## Hints For Teaching The Course

- Demo how fiber works – also on FOA YouTube videos
- POF (plastic fiber) and laser pointer
- FOA can supply POF samples



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102

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## Create A Fiber Datalink Demo

- Demo how a fiber link works
- 2 media converters and fiber create a Ethernet link to connect a computer to your Internet source



Media converters from  
Amazon - <\$100

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103

You can show how a fiber link works with two media converters – Cat 5 to fiber – and a duplex patchcord. The media converters are available from Amazon for less than \$100 – make sure you specify singlemode or multimode – and use the link to connect your computer to your Internet connection. Show how it transmits data, then open one link to show how it fails if it doesn't have a working fiber link. See this demo on Fiber U: <https://fiberu.org/Basic%20Skills%20Lab/Remote/LP-remote-LINK.html>

## Hints For Teaching The Course

- Ask the students questions
- Listen for feedback
- Look for nonverbal clues - e.g. eyes glazed over or snoring
- Accept and answer questions - admit if you don't know something and assign students to find out
- Manage your time carefully
  - Pace the class and try to always stay on schedule
  - Leave time for questions, slow students, stories, etc.

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104

Communicating with students is a two way process. Interrupt your presentation to ask them questions, listen to their answers and to questions they ask you - it's important feedback on how well you are communicating. Watch them to see how attentive they are too.

Students can be hard on an instructor. Admit it when you are stumped by a question (nobody knows everything!) and send them off to help find the answer.

Perhaps the hardest thing for many instructors is to keep on schedule. We have found it best to break the class up into 1-3 hour segments and have a schedule of topics to cover. Work hard to not go over - once you get behind, it's hard to catch up!

## Avoid The TLAs\*

- \* TLAs = three letter acronyms
- Telecom and fiber is full of TLAs – WDM, MMF, SMF, SOC, APC, POF, PON, DAS, PMD, etc., etc., etc.
- Never use a TLA without defining it
- Never use a TLA if you can avoid it

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105

Technology and especially telecom and fiber optics use way too many TLAs. Part of it is laziness, part is the belief that creating your own language impresses people or creates an exclusive club of insiders. But we can guarantee it is just confusing to most users. Never use a TLA when you can avoid it. Always define it. After you use the term followed by the actual name (or vice versa) a number of times so you know everyone knows what it means, only then is it OK to use it.

## Hints For Teaching The Course

- How do you deal with problem students?
  - Experienced
  - Know-it-alls
  - Questioners - on or off the subject
  - Talkers
  - Rude - really do not want to be there
  - Slow learners
- Remember you are the boss!

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106

What do you do?

Keeping a class focused and interested may be the best way to minimize problems with students, but sometimes you just get a winner.

Experienced students often are assigned to a class by their supervisors without regard to experience. They can easily get bored or decide to become a "Know-it-all" and be a problem. Enlist their help - ask them to relate relevant experiences (make sure they are relevant) or help tutor slow students.

Know-it-alls are usually those who have some experience or have take another class. They always know another - and in their opinion, better - way. It can be tiresome, but often letting them tell their story is the best way, and they will get tired of it or quit if their line is not true or acceptable practice.

Questioners can be a real time drag, but if their questions are legit, they can often be used to make examples for the class to the benefit of all. If it's something that will be covered later, say so, and ask them to hold onto that question.

Talkers should be told that only one person is allowed to lecture at one time - and you are the teacher. Ask them to leave if they refuse to stop.

Every teacher has had a rude \$%^&\*() in their class. If they persist, toss them out, with no return and tell their supervisor why you ejected them.

Slow learners can be a problem. They can drag the class down if too much attention has to be paid to them. Pairing them with a good or experienced student for tutoring can help.

Sometimes, you just get someone who does not have the ability to learn the material or do the lab exercises. Sometimes you just have to take them aside and tell it like it is! Some students can never master termination or splicing because of the small motor skills required, but they can still pull cable and install other hardware.

Make sure you are perceived as the boss - students, like any predators, easily recognize weakness!

## Hints For Teaching The Course

- Running a lab requires organization
  - Use lab partners - pair newbies with experienced techs
  - Enough table space to spread out
  - Equipment (for 2 students) in one case or box
  - Consumables prepared ahead of time to save time
  - Have handouts of exercises
  - Demo first while students watch - no tools out yet!
  - Do exercises step by step
  - Have patience, heap praise
- Preach Safety! EVERYBODY wears safety glasses!
- Have fiber disposal bins on every desk!

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107

For the hands-on activities, safety is the first concern. Everybody wears safety glasses, even the instructor! No, ESPECIALLY the instructor! An organized lab will make teaching easier. Provide adequate space for students and a clean workspace. Black mats make seeing fibers easier and finding scraps easier too.

Have all the tools at each station and make sure they are OK before starting a lab. Keep all the equipment for each student pair together in a case or tool rollup (available at hardware stores). Count out all the consumables necessary and put them in a single bag for each pair of students.

Create your own student aids, like stripping guides for termination, that make it easier. Break the process up into step-by-step processes.

Demo the process once before starting so the students know what to expect.

Be patient! But push the slower students a bit but keep the "go fast" students reigned in.

You need to be careful of fiber scraps. We have used deli soup or salad cups with tops for scrap disposal.

**Fiber Optic Installation Safety Rules are on the FOA YouTube channel and on the FOA website in Tech Topics: [www.thefoa.org/tech/safety.htm](http://www.thefoa.org/tech/safety.htm)**



## Teaching FOA KSAs

- The FOA requires
  - basic knowledge of the certification subject
  - demonstration of basic skills appropriate to the certification
- Knowledge is tested by the CFOT exam
- Skills must be verified by the instructor



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108

The FOA certification requires Knowledge, Skills and Abilities. The knowledge is imparted in class and tested with an online test. The instructor is responsible for evaluating the individuals skills and abilities as demonstrated in the labs.

## About FOA Certification Exams

- The exams are based on FOA KSAs
- References are the appropriate FOA textbooks, FOA Online Reference Guide and curriculum PPT slides
- Online, closed book test, proctored by instructor
- Teach the basics for success
- More on exams and credentials later

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109

Becoming a certified instructor requires taking the exam yourself so you will see how closely we follow the references.

The FOA exams cover the basic information in the KSAs and in the references we provide – textbooks, FOA Guide and class PPTs. There are no trick questions. Only a few require some basic math – dBs and loss budgets.

Remember it is a closed book test and every student must take the test individually. **THAT IS THE RESPONSIBILITY OF THE Examiner.** It is **NOT** a class exercise. We have seen returns where the entire class got the same grade and missed the same questions! We are on the lookout for that!

The test is basic; it covers the types of materials that should be covered in any basic fiber optic class.

Remember it is a closed book test and every student must take the test individually. **THAT IS THE RESPONSIBILITY OF THE INSTRUCTOR.** It is **NOT** a class exercise. We have seen returns where the entire class got the same grade and missed the same questions! We are on the lookout for that!

Remember all Certified Instructors must be CFOT and must pass the appropriate certification exam for any certification course they teach so you have taken the test yourself and know its level of difficulty. Review the exam occasionally to see what is

covered, just to make sure you cover the material in your class.

## Student Requirements

- ALL Students must show KSAs: knowledge, skills and abilities
- Pass online exam required
- Instructors must proctor exams
  - Closed book
  - No time limit but 1 to 1.5 hours typical
- Instructors must certify that each student submitted for certification has shown skills in fiber optic labs

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110

Here is a summary of the requirements for students.

## FOA Specialist Courses

- Basic courses prepare student for OJT
- Specialist courses add to knowledge and/or develop skills by more hands-on exercises (splicing, testing, OSP, network design, etc.)
- Specialist courses also cover applications (fiber to the home, data centers, wireless networks, optical LANs, etc.)
- Basic course is prerequisite for skills specialist courses

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111

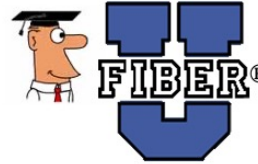
Students taking a basic course (CFOT or CPCT) get basic knowledge but rarely have the repetitions to gain skills, leaving practice in the art to OJT or simply learning by trial-and-error which can be very expensive. Some schools offer specialist courses that teach greater knowledge and skills, for which the FOA offers certifications.

Teaching an advanced course requires an instructor with the knowledge and skills to understand the technology themselves. But students completing such a course will have sufficient skills to save the cost of the course just in the first few jobs that they do correctly, by producing better designs, higher yield of good links and faster work.

Detailed requirements for a specialist certifications are on the FOA website.

## Blended Learning Using Fiber U

- [www.fiberu.org](http://www.fiberu.org)
- Use Fiber U or school's own online training for "knowledge" part of course
- Review in class what students learn online
- Spend more time in class in hands-on labs
- Class goes faster and is more effective.



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a registered  
trademark of FOA"*

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112

Fiber U is the FOA online learning site with dozens of free courses that can be used as part of FOA certification training. Use the Fiber U Basic Fiber Optics course as a prerequisite for your students and they will arrive in class with some basic knowledge that will make class more effective and move along faster.



# FOA Resources

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113

## US Department of Labor Resources

- FOA helped create new "Telecom Tech" job designation at Bureau of Labor Statistics
- Covers job description and compensation
- Lots of interesting and useful information for students

The screenshot shows the Occupational Outlook Handbook page for Telecommunications Technicians. The page includes a navigation bar with links for Home, Research, and Data Tools. The main content area features a 'Summary' section with the following data:

Quick Facts: Telecommunications Technicians	
2022 Median Pay	\$45,390 per year
Typical Entry-Level Education	High School or GED
Work Experience in Related Occupation	None
On-the-job Training	1-2 Years On-the-Job
Number of Jobs, 2022	245,000
Job Outlook, 2022-32	1% (Add'l jobs created)
Employment Change, 2022-32	+24,000

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114

FOA, has been working with the US Department of Labor (DoL) Bureau of Labor Statistics (BLS) for about 20 years to define the jobs of fiber optic technicians. When fiber optics was first added by the BLS, fiber optic techs were placed in a category of "electrical linemen," an age old category for workers who install cables. This year, in part due to the federal focus on broadband, FOA was contacted by a BLS analyst who said there was interest in creating a new category.

FOA worked with BLS for months drafting new job descriptions, brought in some contacts from the Communications Workers of America (CWA), suggested adding wireless techs who were also buried elsewhere in the BLS job definitions to create a new category at BLS for "Telecommunications Technicians."


The BLS Telecommunications Technicians website is live now and is very interesting reading.


<https://www.bls.gov/ooh/installation-maintenance-and-repair/telecommunications-equipment-installers-and-repairers-except-line-installers.htm#tab-1>



## FOA Resources

- Textbooks (FOA)
- Videos (FOA)
- Websites (FOA)
- Manufacturers
- Other teachers
- FOA curriculum (free)
- Fiber U online self-study training (free)



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There are lots of FOA sources for assistance and materials.

Besides textbooks and trade magazines, there are a number of useful websites, and manufacturers are usually happy to share their educational materials.

Don't forget other teachers. Sharing information and advice is a great way to improve your classes.

Here are some resources at your disposal.

## Videos

- FOA on “YouTube”
  - >100 videos from FOA
  - FOA Channel: thefoainc
- Lots more from others
- Videos and PPTs are available on memory stick for use without Internet – ask FOA



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116

The FOA has created a channel on YouTube just to host fiber optic and cabling videos. We have more than 100 lectures, hands-on demos and product reviews that you can incorporate in your classes.

The FOA YouTube channel <http://www.youtube.com/user/thefoainc>

Since most manufacturers develop training aids for their products, you have access to many more videos, websites, books, etc. to help you in your class.

## Internet

- Biggest “library” ever
- Maybe too big!
- Mostly FREE
- Accessible to practically everyone
- Totally disorganized
- Not always trustworthy information
- But it is where everybody goes first for information!
- [www.foa.org](http://www.foa.org), [www.fiberu.org](http://www.fiberu.org)  
[www.lennielightwave.com](http://www.lennielightwave.com)



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117

The Internet is, of course, an immense resource for every topic and fiber optics is no exception. And it is where most people, certainly the majority of younger students, turn first for information.

Every company now has a website and many use it to post their instruction manuals, product training information, etc. online so you can use it in class or for homework.

Beware of misinformation or sales pitches!

And remember most of the information is copyrighted, so give proper attribution for anything you use.

## Using The Internet

- Outside reading
- Homework
- Research
- Web-based training
  - Fiber U
  - Commercial
  - Create your own
- Remind students they can use the FOA tech references once they are working in the field



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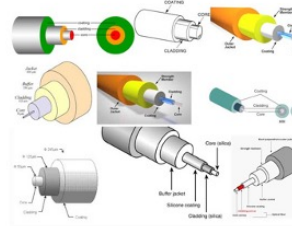
118

Unless you have computers in the classroom, web reading will be outside assignments and the interested students will use it to gain more knowledge.

You can create your own web-based training by creating a lesson plan with links to appropriate web pages and then creating quizzes to test comprehension. It's that simple.

## Can You Trust The Internet?

- Every drawing we could find on the web showed the core sticking out of the cladding, a major reason that ~25% of the CFOT candidates think you strip the cladding when you strip fiber!



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119

Misinformation is everywhere! Not only that, many articles say that loss is a positive number in dB. Watch what you copy off or link to on the web!

## FOA Online Reference Guide

- <https://foa.org/tech/ref/contents.html>
- Almost 1000 technical articles of interest:
  - Basic tech information
  - How fiber is made
  - Fiber optic standards
  - Safety in installations
  - Installation and testing
  - Many advanced topics
  - Has own “Google Custom Search”



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120

Since its founding in 1995, FOA has been developing an online knowledgebase on fiber optics. Today the FOA Guide has about 1,000 pages of technical information on every topic related to fiber optics. Every page was created by experts in the field and does not favor any group, company or opinion – it's considered the most trustworthy site in fiber optics and it's all FREE! The site gets over ½ million visitors per year downloading about 4 million pages from the site.

FOA website Online Reference Guide and Tech Topics(<http://www.thefoa.org/tech/ref> and <http://www.thefoa.org/tech/> ) has numerous other technical articles of interest:

How fiber is made

Fiber optic standards

Safety in installations

Advanced topics

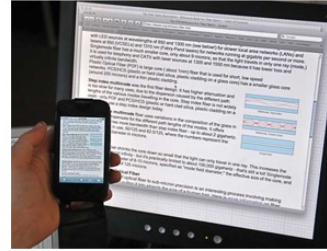
It also has guides for learning about fiber and studying for FOA certifications as well as instructor's guides to using the online resources.

It even has a "Google Custom Search" feature

Lots of great reference materials. And new articles are added all the time.

## FOA Online Reference Guide

- Recognizing the importance of mobile web devices, the FOA Online Fiber Optic Reference Guide has been designed from the outset to be usable on mobile devices like smart phones, tablets
- Important - tell your students about this!



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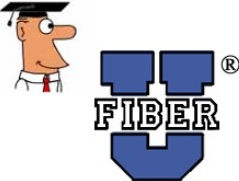


121

Recognizing the importance of mobile web devices today and in the future, the FOA Online Fiber Optic Reference Guide has been designed from the outset to be usable on these devices (iPhone here.) It is very important to tell you students this, as it makes it useful for field reference!


## Fiber U

- [www.fiberu.org](http://www.fiberu.org)
- Free online learning site for FOA
- Self-study programs based on FOA Online Reference Guide
- Preparation for FOA certifications
- Certificate of completion w/exam
- Recommended preparation before taking basic classes – students will be already familiar with the technology before class



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a registered  
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122

Fiber U is the free online learning site from FOA, offering courses in every FOA certification topic plus many more. Each topic has a lesson plan based on the FOA Online Reference Guide and FOA YouTube videos. Every lesson has self-test quizzes that students can use to check their comprehension and an online test that will give them a "Fiber U Certificate of Completion."

Fiber U is being used by many of our regular schools – requiring students to complete online exercises before coming to class, then discussing what they learned online in class before having hands-on labs. It reduces the classroom time needed allowing more time for skills development in labs.

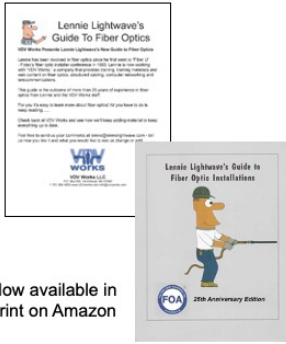


## Lennie Lightwave's Guide

Lennie's Guide started in 1993, inspired by the "dummies" books. It's where many fiber techs started

[www.lennielightwave.com](http://www.lennielightwave.com)

Now available in print on Amazon



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FOA

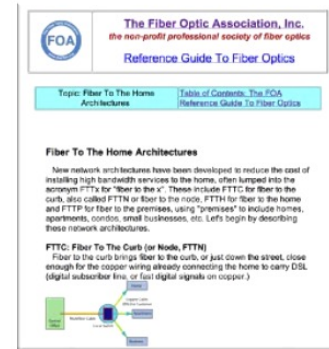
123

Another good reference for the course is *Lennie Lightwave's Guide to Fiber Optics*. You can see it on the web at <http://www.LennieLightwave.com> and a printable version in PDF format is linked from the site with the file name `llguide.pdf`. Lennie began at Fotec's Fiber U in 1993 and was on the web since 1995. Lennie includes a basic fiber optic tutorial, an OTDR tutorial and "virtual hands-on" tutorials on fiber termination and testing. The virtual hands-on tutorials are perfect for introducing students to the exercises because they cover the process in detailed step-by-step format.

Lennie and its companion Uncle Ted's Guide for premises cabling are available online, printed and ebooks.

## Create Your Own Online Training

- Use Fiber U – lessons are already done!
- Find or create relevant web pages
- Create a lesson plan
  - Goals of the lesson
  - Links to online reading material (FOA Online Reference Guide)



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124

Creating your own online training is simple.  
 Create a lesson plan using links to web pages. Establish goals for the lesson.  
 Lead the students to tutorials or articles, then create quizzes to test them.



# Preparation For Instructor Certification

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125

## Taking The CFOS/I Exam

- The exam for instructors is taken online
- Covers technical issues, teaching and about the FOA
- Based on this PPT and the technical references
- When you are ready the FOA office will email you instructions
- FOA will send you log-in and password for the exam to be taken online
- Instructors are expected to achieve score of >80%

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126

The CFOS/I is required for instructor certification – it is taken online. Send in an application and we'll provide directions. Contact The FOA for details.

## Tests Are Online

- Each student gets their own unique test
- Based on the material you were taught
- Try the Practice Test:
- <https://www.classmarker.com/online-test/start/access-code/?quiz=at610b1b57c8708>
- Use the QR code
- Password is "Password" – with capital P



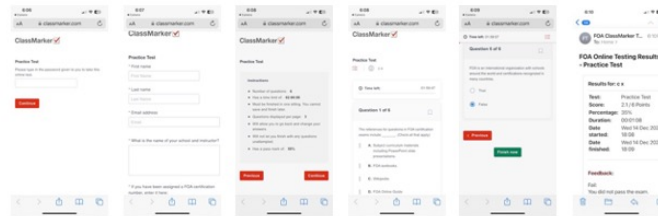
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You and your students can take the Practice Test to see how online testing works. The QR code means they can use a smartphone or tablet to take the Practice Test, or use the school computers if you program the URL for them first.

The test asks for all the information from a regular test but they can put anything in the boxes – like an "X" – instead of real information with the exception of the email – they should use their real email to get the results of the test so they can see how that works too.

# Practice Test



Use Password to start  
Enter data - email  
required

Read directions

Take test

Click to  
finish

Get results on  
Screen and  
Email to you

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Here are examples of the ClassMarker windows on a smartphone. It looks about the same on a tablet or computer.

## When You Take The Certification Test

- Enter your name and a permanent personal email – your online credentials will be linked to this email
- Test results will be emailed to you and FOA
- If you don't pass the first time, can retake test after studying (use Fiber U courses, e.g. Basic Fiber Optics for CFOT)
- Your certification is not official until FOA records it
- You will get email and link to your online certification

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Certification results are tracked and stored in the FOA database by the person's name, email address and FOA certification number.

Students can retake the test if they fail. The school or the FOA can arrange retests.

## FOA Online Certification Credential

- You will receive an email with a link to your online certification credential
- You can share your link to show you are FOA certified
- You can print a certificate too
- Works great with smartphone
- [https://foa.org/Cert\\_Online.html](https://foa.org/Cert_Online.html)



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FOA certification credentials are now online. The person will get an email explaining the online certification form “certifications@foa.org” as soon as the credential is verified and uploaded. The person can share their certification with others, add to their social media accounts and even print a paper certificate.

The URL shown explains the online certification.





The Fiber Optic Association, Inc.  
Tel: 1-760-451-3655 Fax: 1-781-207-2421  
Email: [info@thefoa.org](mailto:info@thefoa.org) <http://www.TheFOA.org>

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131

Contact us with any questions.