

Instructor Guidelines for Teaching Amateur Radio License Classes for the Technician, General and Extra License Using AD7FO's Syllabuses

Pre-class Planning:

1. Determine whether your class will be taught in multi week (8-10) 2 to 2 1/2 hour segments or in 2-3 full day (7 hour) sessions.

The technician class can be taught in one and a half to two seven hour days or six to seven two hour evening sessions.

The general and extra classed will take two a half to three seven hour days or eight or nine two and a half hour evening sessions.

2. Determine your maximum class size, 10 to 15 students would be ideal, (20 Maximum for technician and general and 10-15 maximum for the Extra class).
3. Determine how the class will be taught, one instructor for entire class or broken down to different instructors who have better knowledge in certain areas. All instructors need to review the syllabus and prepare in advance for what they will be teaching.
4. Determine dates and a location and facility where you will teach the class. The requirements for the facility are:
 - Easily accessible location with adequate parking for students.
 - Handicapped access if possible/needed.
 - Seating for students, preferably with writing table or desks for student's to place their note taking pad and printed syllabus on.
 - A white board or black board for the instructor to use when explaining material.
 - A table for demonstrations with electrical power available nearby.
 - Rest room Facilities.
 - A place to eat their lunch for all day sessions (or access to nearby fast food restaurants)
5. Four weeks, or more, in advance advertise the class at local club meetings, on the air nets, public bulletin boards (for the Technician class), club web sites, post on ARRL web site, and ARRL SEC newsletter (if they have one)
6. Have students register via email with their name, call sign (if it is a General or Extra class), email address, and a phone number where they can be reached in case of last minute class change or cancelation.

7. Confirm registration back to students via email or phone.
8. Determine how students will obtain a personal copy of the syllabus. Some possibilities are:
 - Give each registered student a copy of the syllabus electronically and ask them to print a copy and bring it to class (a printed copy is required for each student).
 - Arrange with local copy service (Kinko's, copy centers, UPS store, etc.) to print copies on demand for students. I suggest heavier paper, double sided and spiral bound. B&W copies should be no more than \$10, and color printings less than \$20 from my experience with a local UPS Store.
 - Print a quantity of copies in advance and collect printing cost from students at the start of the first class.
8. Prepare a short introduction to Ham radio presentation for the start of the Technician class. A sample is available from the author (ad7fo@arrl.net).
9. Decide if you want to arrange a test section at the last class session or direct students to other local test sites. If you plan a test session line up the VEC team, and be sure the students know they will need to have the testing fee at the test session (cash or check) along with picture ID and a duplicate copy of their license if testing for the General or Extra License.

Student requirements:

1. Register for the class
2. Obtain a copy of the Syllabus.
3. Bring a basic scientific calculator to class. If they do not already have one they are available from office supply stores, wall mart and others for around \$10. Ask the students to become familiar with the basic operation of the calculator prior to the first class. The calculator is optional for the Technician class but required for the General and Extra classes.
4. Bring pencil/pen and note paper for taking notes during class.
5. Be on time for the start of each class.

Instructor preparation

1. Decide order of instruction for the material in the syllabus.
 - For the technician class I go from the sub element 1 to sub element 0 in consecutive order.
 - For the general and Extra class I go out of sub element order to have better flow of training (see syllabus for authors recommendation) .
2. Decide on training aids and demonstrations to be used during class and where they will be inserted in your instruction. (Some recommendations are at the end of this document).
3. Have chalk or dry eras6++e markers and an eraser. Cleaning spray for dry erase boards
would be a good idea to have in your kit.

Suggestions for teaching a license class using the AD7FO syllabuses.

1. Explain how the class will be taught and what it takes to pass (how many questions can they miss and still pass the exam). Explain that the test is broken down into sub elements and groups and that a fixed number of questions will be asked form each sub element and no more. Explain that you will teach all elements and you will try to explain all questions when clarification is necessary or they have questions,
2. Tell the students that if they have difficulty with a particular section they can decide to focus less on it and learn the topics they do understand. This will help them successfully pass the exam.

Also point out that if they take this approach and pass they should go back to the sections they had difficulty with and re-study them after passing the exam.
3. Teach directly from the syllabus going over each question statement adding thoughts or additional points or clarification as appropriate.
4. Use visual aids to enhance learning whenever possible to show real world items talked about in the question, (see list of what this author uses when teaching the class later in this document)t.
5. Invite questions from students during class if they do not understand something. Let them know that this okay and expected because if they have a question there is a good possibility that someone else in the class has the same question.

6. Ask questions to the class to check on their learning (do not direct at a specific student).
7. Talk about experiences with ham radio by yourself and others to hold class interest
8. Encourage students to take practice exams at one of the on line sites:

<http://aa9pw.com/radio/>

<http://www.eham.net/exams/>

<http://www.grz.com/ham/>

Visual Aids:

Most component and show and tell items can be passed around to the students.

Component boards:

(4"x6" plastid boards with the following components affixed to them)

Resistor Board – 1/8 thru 2 watt axial lead, wire wound, adjustable potentiometer

Capacitor Board – Axial capacitors .001 to .05 MFD, small value silver mica or Dura Mica, Ceramic disc capacitors. Axial electrolytic, and large value screw terminal electrolytic capacitors, Variable capacitors (Slug tuned, mesh plates, etc.)

Inductor Board - Small value axial inductors , coil of 14 gauge wire, Iron core chokes (toroidal and axial), slug tuned coils

Diode Board – Small signal detector diodes (1N34/1N60 size), rectifier diodes (axial, stud mount, packaged bridge rectifier), Light emitting diodes.

Diode Board (2) - A nine volt Battery with 800 ohm resistor, LED and $\frac{3}{4}$ " spaced banana plug in series. A rectifier diode is placed on a dual banana plug that can be inserted in forward or reverse direction. Led lights in forward conducting position and is extinguished in the reverse conducting position.

Transistor Board- Small signal types, power types, stud mount types

Integrated Circuit Board- 7400 types, 8 pin 555 type, Computer processors (Pentium processor or similar, MMIC (mini circuits)

Relay Board – Different types of relays – open frame, sealed miniature, coaxial, reed relays

Meter board – Smaller panel meters (4 on board).

Receiver Board – Ramsey kit AM (or AM/FM) receiver demo board to show super heterodyne circuit elements in a working receiver.

Vacuum Tube Board – Subminiature, miniature, octal, smaller special types (like 955, 5675) or anything else in your junk box.

Transmission line board – short pieces of twin lead, ladder line, RG8, RG 8X, RG 58 or 59, Semi rigid transmission line attached to the board.

RF Connector board – Different types of connectors encountered in Ham Radio- SMA male and female, UHF male and female, Type N male and female, BNC male and female, TNC Male and Female, F series male and female.

General Connector board- Other connectors encountered in Ham Radio - DB 9 male and female, DB25 male and female, Din connector male and female, RCA phono male and female, ¼ “ phone plug male and female, Small phone plug.

Show and tell items to bring to class:

Directional watt meter - Bird 43, Heathkit, or similar, Cross needle like Daiwa CN801 or similar.

Dummy load – MFJ, Bird Termaline series, Heathkit Cantenna (without oil) or similar.

Antenna Analyzer - MFJ 259 or 269 antenna analyzer.

Larger Transmitting tubes – Like 813, 4-400, ceramic type (4CX250 for example).
Anything you can find in a clean non-working tube at a hamfest or your junk box.

Yagi Antenna – Surplus 900 MHz cellular antenna which is small enough to pass around and show Reflector, Driven and Director element size relationship.

Ground Plane Antenna – Home made 440 ground plane antenna.

Analog Voltmeter – Simpson 260, Triplet 630, Heathkit, Harbor Freight or similar

Digital multimeter- Any digital hand held or bench type multimeter

Manual Antenna Tuner - MFJ 940 or similar – Remove top cover to show elements inside (Tapped Inductor, variable capacitors, toroidal balun (transformer) for balanced antenna)

Demo items:

Hand Held (HT) – To demonstrate open and closed squelch, repeater courtesy tones and ID, Echo Link (we set up a schedule with an operator in Australia for one of my classes), phone patch, checking into a net, etc.

Spectrum Analyzer- Show frequency vs. amplitude of signals in the 2 meter band (or any active band). To see FM modulation on a hand held. I use an HP 8920 Communications Test Set spectrum analyzer function for this. Any inexpensive ham fest Spectrum analyzer or other radio test set with a spectrum analyzer display could be used (there are a lot of older Tektronix, HP and AVCOM analyzers available at hamfests and e-bay for \$ 200 - \$300 or less).

RF signal generator with an HT – I use the signal generator function in the HP 8920A (any other signal generator like HP 8640A, Fluke 6060A, or Wavetek) above to demonstrate that additional deviation means a louder signal and that modulation frequency does not.

Function generator and Oscilloscope – I bring an HP3312A Function Generator and an old Tektronix Oscilloscope to show Sine , Square, Triangle , Saw Tooth Pulse waveforms and FM and AM modulation. Different function generators can be used but may not provide all the functions listed.

Resonant Circuit - Variable capacitor, fixed inductor parallel resonant circuit at approx. 7 MHz with BNC connector. Demonstrate parallel resonance with HP 8920A spectrum analyzer and tracking generator.

Class Handouts:

ARRL Frequency Band Plan – Can be purchased from ARRL web site

ICOM Band Plan – Available from ICOM America in Bellevue WA

Grid Square Map – Request from ICOM America in Bellevue WA

Additional Information – Any additional handouts you think appropriate to enhance learning or understanding.