

Amateur Extra License Course

Instructors:

Rick-WØPC, John-NØHMZ, Jay-WØPS,
Jim-N5MU, Ken-WØKAH, Gordon-AH6DA
Bob-ADØGF

The College

- Non Smoking Campus
- Restroom – Down the hall to the right
- Cell Phones – Take call outside classroom
- Emergency Phones – End of hall & Classroom
- Blue Light in Parking lot – Emergency Phone
- Department of Public Safety – Will Escort
- Trash – Cleanup after yourself (trash & recycle containers)

Instructor Team

- Rick Crockett – WØPC
- John Lehnhoff – NØHMZ
- Jim Richardson – N5MU
- Ken Humbertson – WØKAH
- Jay Underdown – WØPS
- Gordon Deno – AH6DA
- Bob Perrey - ADØGF

Student Introduction

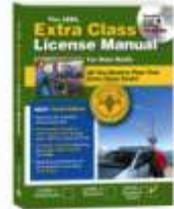
- Introduce yourself
 - Name & Call Sign?
 - How did you hear of this class?
 - How long have you been a ham?

Credits

- PowerPoint Side Material taken from an outline of “The Extra Class License Manual, 10th Edition
- Graphics also are from the same textbook as well as the ARRL’s web site for Instructor material

Class Format

- Textbook: “The ARRL Extra Class License Manual, 10th Edition”
- 11 Chapters are divided into 9 groups
- Reading assignments are the responsibility of the student! (*If you miss a class keep reading up to schedule*)
 - The Extra Class means putting an **EXTRA** amount of study time
 - Classroom discussion will not replace doing the assigned reading and homework



Class Schedule

- March 26 - Chapters 1 & 2
“Introduction” & “Operating Practice”
- April 2 - Chapter 3 “Rules and Regulations”
- April 9 - Chapter 4
“Electrical Principles”
- April 16 - Chapter 5
“Components and Building Blocks”
- April 23 - Chapter 6
“Electronic Circuits”
- April 30 - Chapter 7 “Radio Signals and Measurements”
- May 7 - Chapter 8 “Radio Modes and Measurements”
- May 14 - Chapter 9
“Antennas and Feed Lines”
- May 21 - Chapter 10 & 11
“Topics in Radio Propagation” & “Safety”
- May 28 - VE Test Session
(open to walk-ins)

How to Use the Book

- Read the Chapters as Assigned
- Do the Practice Questions as called out in the reading
 - Test Question by Chapter:
<http://www.arrl.org/files/file/Extra%20Class%20License%20Manual/ECLM%2010th%20edition/Studyguide%20%20FINAL.pdf>
 - Supplemental Information by Chapter:
<http://www.arrl.org/extra-class-license-manual>

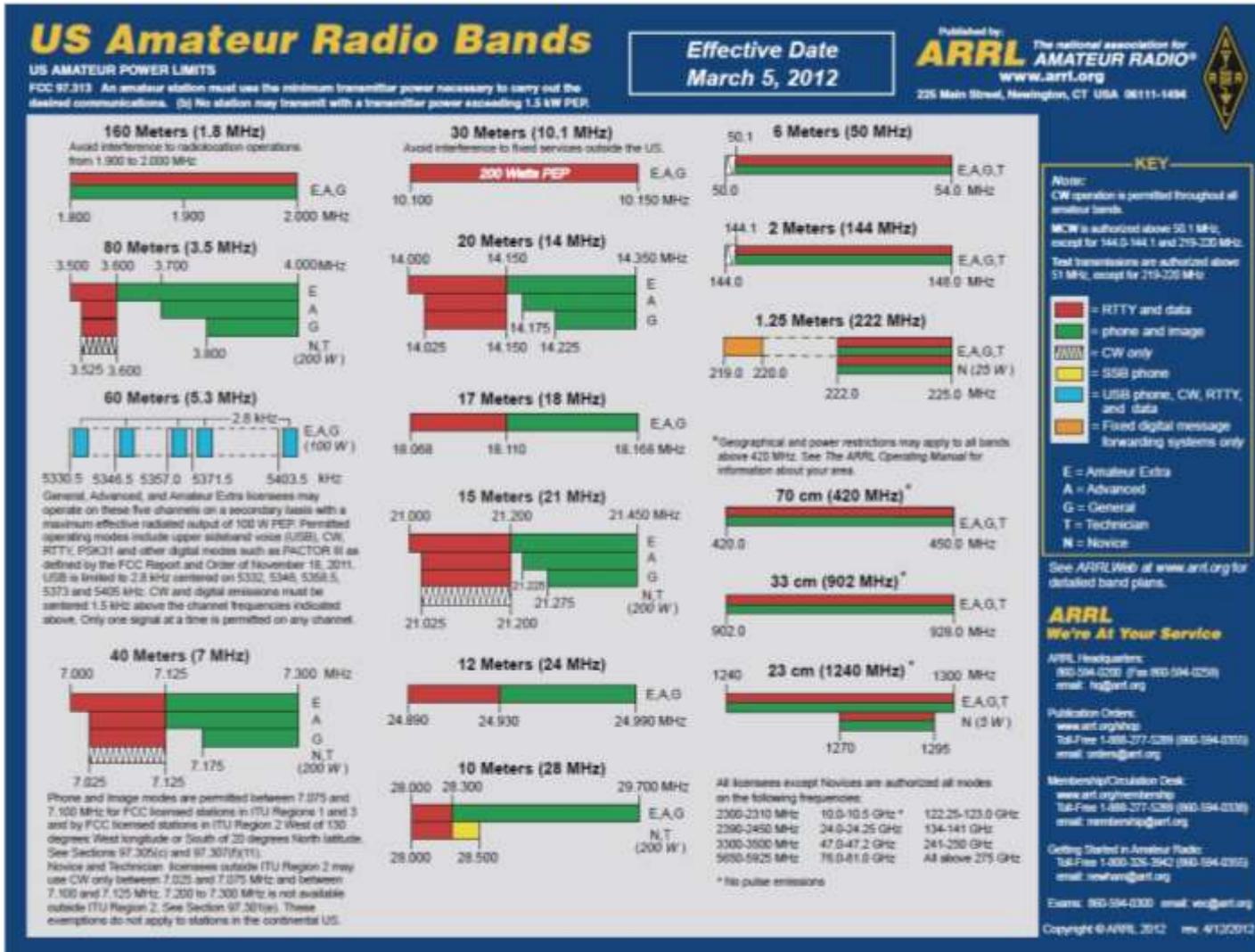
How to Use The Book

- Updates and Correction to the License Manual
 - <http://www.arrl.org/files/file/Extra%20Class%20License%20Manual/ECLM%2010th%20edition/Extra%20Class%20License%20Manual%2010th%20Edition%20-%20Supplement%20and%20Errata%20-%2030%20Nov%202013.pdf>
- Practice Exam Software CD Included
 - Do practice exams by chapter (Demo)

The Extra Class License

- Greatest achievement in amateur licensing
- All amateur frequencies are now available
 - The best DX windows are available
- You can have a special Extra Class Call Sign
- Volunteer Examiner (VE) for all levels
- Extra's don't have to be a Technical Guru
 - Other may think you are so...

Frequency Chart



Operating Practices

- DX Windows and Watering Holes (Table 2-1)
 - The definition of DX depends on the bands on which you are operating
 - VHF/UHF may be 50 to 100 miles away, beyond the radio horizon or Moon Bounce
 - HF usually means working foreign countries
 - HF is usually on the bottom of the bands
 - “DX Windows” narrow range of frequencies reserved for weak signal or foreign stations calling only. US listens for DX (1.830 – 1.835 MHz)

Operating Practices

- Pileup Productivity
 - You have to be able to hear the DX station before you start calling - Stay in Sync
 - Timing is critical (many techniques)
 - Say your full call sign twice using standard Phonetics
 - Use short transmission (Language limitations)
 - Operating Split (listen to instructions)
 - Backing up to a band edge forces pile one direction
 - Spreads out the pile of callers (working up 5)
 - Listen for QSL information (QSL Manager)

Operating Practices

- Dxing Propagation
 - You can't work them if you can't hear them
 - Understanding propagation is crucial to Dxing success
 - Sun Spot Cycle
 - Day/Night Conditions
 - Grayline
 - Rapid Signal Fading (QSB) – just before going out
 - (MUF) Maximum Usable Frequency is dropping
 - Use Propagation Prediction Software - modeling

Operating Practices

- Contesting (Radio Sport) on the air events
 - Making the maximum number of contacts within defined time limits and according to the rules.
 - Competitive outlet
 - Quickly achieve Awards (WAS, DXCC)
 - Enhance operating efficiency (Honing Skills)
 - Pull weak signals out
 - Maintain log in the heat of battle
 - Improve your own station and antenna system
 - Improved score implies improved operating proficiency

Operating a Contest

- Good activity to learn about radio-frequency propagation and planning an operating strategy
- Search & Pounce Method
 - Tuning up and down a band for stations to contact
 - Listen how to say the exchange
 - Listen for the cadence of the calls and responses
 - S&P is the easy way to get started Contesting

Operating a Contest

- Running a Frequency
 - Maintaining control of a frequency
 - Station calling CQ Contest or CQ Test
 - Let others come to you
 - Usually results in a larger total score
 - Hard core contesters say “IF you aren’t running, you are loosing”

Operating a Contest

- Submitting a Contest Log
 - Cabrillo Format is a standard for organizing information where the sponsor can check and score the QSOs.
 - Each contest has a deadline for submitting a log file via email in a Cabrillo Format
 - Contest participants are not require to submit a log
 - Submitted contest logs to LoTW can earn awards

Operating a Contest

- Using Spotting Networks:
 - Contests entrants in the single operator category are usually required to do everything themselves
 - Finding stations to contact including multipliers
 - operating the radio
 - logging
 - The use of Spotting Networks during a contest to locate stations puts the operator in the “Assisted” entry classification. (i.e. Single Operator Assisted)
 - Spotting Networks can not be use for self spotting

Digital Mode Operating

- Packet Radio
 - Most often used on VHF/UHF FM using AFSK modulation at 1200 baud on 2-Meters
 - Data is exchanged in frames using the AX.25 protocol standard
 - HF Packet uses 300 baud with FSK of a SSB signal
 - Hardware: Transceiver, TNC, Computer with terminal software

Digital Mode Operating

- Packet Cluster – DX spotting network uses a special type of bulleting board software
 - System allows many station to be connected to the PacketCluster Host and communicate with each other to share “DX Spots”
 - Information is retransmitted to all stations connected on the cluster

Digital Mode Operation

- PACSAT
 - (LEO) Low Earth Orbit Satellites that are in a “sun synchronous” orbit
 - Satellites function as a packet bulletin board store-and-forward system
 - A station can upload a message to the satellite and another station can download the message when it’s in view

Digital Mode Operating

- APRS – Automatic Packet Reporting System
 - Developed by Bob Bruninga, WB4APR
 - Uses a common frequency nationally (144.390 MHz)
 - Uses Standard Packet radio equipment plus a GPS
 - Uses Packet radio beacon function transmitting station call sign and GPS position information
 - Uses non-connected packet AX.25 to transmit short messages between stations. (Mostly on 2-Mtrs)
 - Uses an Internet backbone that allows long distance communications (www.findu.com) using Igates

Amateur Satellites

- Satellites provide Amateurs a greatly increased communication range by using the repeaters, transponders, or store-and-forward equipment onboard Satellites orbiting the Earth
- Most of the satellites can be accessed or used to relay signals with very modest equipment
- More information at www.amsat.org

Amateur Satellites

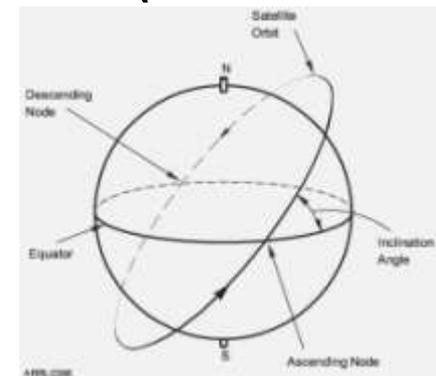
- Understanding Satellite Orbits
 - 2 factors affect a body in orbit around the Earth
 - Forward Motion – inertia keeps the body moving in a straight line direction
 - Gravity tends to pull the body toward the Earth
 - When inertia and gravity are balanced, the object's path is a stable orbit around the Earth
 - One Orbit is one complete revolution around the Earth

Amateur Satellites

- Understanding Satellite Orbits
 - Johannes Kepler mathematically described the orbits of planets (3 Laws)
 - Keplerian elements allow you to calculate the position of the satellite at any time
 - Geostationary satellites stay in the same position over the earth. They are geosynchronous with the Earth's orbit

Amateur Satellites

- Orbital Mechanics - Vocabulary
 - Inclination is the angle of the satellite orbit with respect to the Earth (Fig. 2-6)
 - Node is where the satellite's orbit crosses the equator
 - Ascending Node is where it crosses the equator from south to north (ascending pass)
 - Descending node is the point where the orbit crosses the equator traveling from north to south (descending pass)
 - Apogee is the greatest height
 - Perigee is the point of least height



Amateur Satellites

- Faraday Rotation
 - Satellite's signal changes polarization as it passes through the ionosphere
 - Best way to deal with Faraday rotation is to use a circular polarized antennas for both TX and RX
- Spin Modulation
 - Satellites are often stabilized by being spun about an axis like a gyroscope
 - Spin Modulation is the Fairly rapid , pulsed signal fading happening when the spin axis is not pointing directly at your ground station

Satellite Operation

- Repeaters
 - Satellite Repeater are like terrestrial repeaters
 - Cross-band to avoid heavy cavity duplexers
- Transponder is the name given to any linear translator that is installed in a satellite
 - Transponder receive signals from an entire segment of a band are shifted to a new frequency range and retransmitted on a different band
 - Multi Mode (SSB or CW) FM discouraged
 - Limit ERP to allow as many signals to access the transponder
 - Transponder are usually identified by “mode” (U/V, V/U, L/U, V/H, etc. Table 2.2)
- Satellite Operating Frequencies (uplink/downlink) Fig. 2-9 and Table 2-2)

Homework

- Read Chapters through Chapter 3
- Do the practice questions as called out in the textbook
- Use the Practice Test CD to insure you are familiar with the test material.