

# Radio Amateurs of/du Canada

## RAC Maple Leaf Operators Advanced Qualification Course

### Winter/Spring 2023: Course Syllabus

#### Session 1 – February 19 or 20

##### Study Guide sections: 1.1 through 1.15, Appendix 1



Gold Level

- A-001-001 RC and RL time constants
- A-001-002 Skin effect, capacitance, electromagnetic fields
- A-001-003 Series RLC circuits: calculations
- A-001-004 Parallel RLC circuits: calculations
- A-001-005 RLC Circuit Q: calculations
- Total: 54 questions – 10%

#### Session 2 – February 26 or 27

##### Study Guide sections: 2.1 through 2.15



Silver Level

- A-002-001 Semiconductor materials, P vs N material, doped vs non-doped materials
- A-002-002 Diodes: zener, varactor, junction vs point-contact diodes
- A-002-005 Silicon-controlled rectifiers
- A-002-003 Bipolar transistors: alpha, beta, common-base and common-emitter circuits
- A-002-004 FETs, JFETs, MOSFETs
- A-002-007 FET input and output impedance; inputs vs outputs of bipolar circuits; common base, common emitter, common collector; FETs vs Bipolars
- Total: 66 questions – 12%

#### Session 3 – March 5 or 6

##### Study Guide sections: 4.1 through 4.10, 5.1 through 5.10, and 1.16.1 through 1.16.7



Bronze Level

- A-002-006 Amplifiers: Classes A, B, AB, C; efficiency, phase, linearity
- A-002-009 Mixers and multipliers
- A-002-008 Op-Amps
- A-002-010 Logic circuits: NAND AND OR NOR XOR XNOR Flip-flops
- A-002-011 Crystal lattice filters, crystal oscillators
- A-002-012 LC filters: Butterworth, Chebyshev, cavities, helical resonators
- Total: 66 questions – 12%



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## Session 4 – March 12 or 13

### Study Guide sections: 11.1 through 11.9

- A-003-001 Peak-to-peak vs RMS; sine waves, AC vs DC measurements
- A-003-002 PEP vs RMS for RF power; Ohm's Law for power, PEP calculation, RF power measurement
- A-003-003 Dip meters, signal generators, FM SINAD measurement
- A-003-004 Frequency counters, timebase, marker generator, crystal calibrator
- A-003-005 Oscilloscopes: use, accuracy
- A-003-006 Voltmeters, ammeters, shunts
- Total: 66 questions – 12%

## Session 5 – March 19 or 20

### Study Guide sections: 7, 9.1, 9.3 through 9.6, 9.8 through 9.10, and 13.1 through 13.9

- A-005-001 Oscillators: Hartley, Colpitts, Pierce, VFOs, PLLs
- A-005-002 Amplifier design: PI networks, PI-L networks, grounded-grid triode, bypass caps on filaments, shielding
- A-005-003 Amplifier parasitics, neutralization
- A-005-004 SSB: balanced modulator, carrier suppression, PEP, 2-tone testing
- A-005-007 SSB transmitters, DSP
- Total: 55 questions – 10%

## Session 6 – March 26 or 27

### Study Guide sections: 9.2, 9.7 and 6.1 through 6.5

- A-005-005 FM: modulation index, deviation, central frequency
- A-005-006 Intermod, phase modulation, repeaters, cavity filters
- A-005-008 Digital: ASCII, Baudot, ARQ, AX.25, Forward Error Correction, APRS
- A-005-009 Spread Spectrum
- Total: 44 questions – 8%

## Session 7 – April 2 or 3

### Study Guide sections: 3.1 through 3.15

- A004-001 Power supplies: transformers, rectifiers, ripple, AC voltage double, HV PSUs
- A004-002 DC filters: capacitor and choke; regulation; bleeder resistors
- A004-003 Regulated power supplies: linear regulators, switching, zeners as voltage regulators, regulator ICs
- A004-004 PSU regulation
- Total: 44 questions – 8%



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– No classes: April 9 or 10 for the Easter weekend –

## Session 8 – April 16 or 17

Study Guide sections: 8.1 through 8.10

- A-006-001 Superhet receivers: single- and double-conversion
- A-006-002 Superhet receivers: IF, BFO, mixer
- A-006-003 Receivers: noise floor, purposes of stages in a receiver, SINAD (FM)
- A-006-004 Receivers: product detector, AGC, BFO
- A-006-005 Receivers: selectivity, desense, intermod
- Total: 55 questions – 10%

## Session 9 – April 23 or 24

Study Guide sections: 14 and 15

- A-007-001 Antenna tuners: transformers, series, L-network, PI network
- A-007-002 Transmission lines: 1/4-wave XFMRs, 1/2-wave XFMRs, velocity factor
- A-007-003 Feeding antennas: T-match, gamma, omega, delta, stub
- A-007-004 Antennas: current and voltage distribution, impedance
- A-007-005 Antennas: polarization (horizontal, vertical, circular), Doppler, cross-polarization, helicals, parabolics
- Total: 55 questions – 10%

## Session 10 – April 30 or May 1

Study Guide sections: 14 and 15

- A-007-006 Antennas: feedline loss, ERP, SWR, dB
- A-007-007 Antennas: influence of height on directivity, wave angle, dipole impedance, Near vertical incidence skywave (NVIS)
- A-007-008 Antennas: radiation resistance, interaction, beamwidth, efficiency
- A-007-009 Antennas: waveguide, microstrip line
- Total: 44 questions – 8%

### Dates to be arranged:

Advanced Examination by ISED Accredited Examiners.

### For complete information on the course please visit our website at:

<https://www.rac.ca/rac-advanced-course-for-maple-leaf-operators-winter-2023>

Contact information: [advancedcourse@rac.ca](mailto:advancedcourse@rac.ca)

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