

**COURSE:** QIC862/ECE676E/PHYS762

**COURSE TITLE:** **Laboratory on Low Temperature Quantum Technology and Nanofabrication**

**INSTRUCTORS:** Prof. Christopher Wilson  
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Office Hours: by appointment (via email)  
Wednesday 1:00pm - 4:00pm, RAC 3003

**LAB HOURS:** Wednesday 1:00pm - 4:00pm, RAC 3003

**LAB COORD:** Michael Grabowecky  
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**TA:** Cindy Yang  
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**DESCRIPTION:**

This course gives an introduction low-temperature measurement techniques and the properties of superconducting devices relevant to quantum technologies. It also touches on nanofabrication and microwave techniques.

**SYLLABUS:**

Date	Topic	Reading Due
May 7th	Lab 1: Labview Intro & Superconducting Transition Temperature	VD Ch 1
May 14th	Lab 1: Superconducting Transition Temperature	
May 21th	Lab 2: Labview I-V curve tracer	
May 28st	Lab 2: Current-Voltage Relation of a Josephson Junction	VD Ch 2 MT 3.7-3.8
June 4th	Fabrication Lab at QNFCF (tentative)	
June 11th	Lab 2: AC Josephson Effect (Time permitting)	
June 18th	Lab 3: VNA Measurement Introduction	
June 25th	Lab 3: VNA Measurement of a Superconducting Resonator	Pozar Excerpts
July 2nd	Lab 3: Introduction to RF mixing	
July 9th	Lab 4: Superconducting Qubit — Spectroscopy	MWL chapters
July 16th	Lab 4: Superconducting Qubit — Characterization and Calibration	
July 23rd	Lab 4: Superconducting Qubit — Coherence times	

**COURSE MATERIAL:** Lab assignments and other material will be provided on **Learn**.

**OTHER REFERENCE:** *Principles of Superconductive Devices and Circuits*, T. Van Duzer. Prentice Hall, (1999). *Introduction to Superconductivity*, M. Tinkham, McGraw-Hill (1996). *Building Quantum Computers*, Majidy, Wilson, & Laflamme, Cambridge (2024). Copies of these books will be available in the lab room, RAC 3003.

**MARKING SCHEME:**

- Lab Participation: 25%
- Lab Reports: 50%
- Term Paper: 25%

**Academic integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity for more information.]

**Short-term Absence:** Students cannot use the self-declared short-term absence policy to be excused from required labs and clinics (these must be scheduled as type LAB or CLN on the schedule of classes). This means any absence from a scheduled lab will only be excused with a Verification of Illness Forms (VIF), which must be completed by your family doctor or UW Health Services. In particular, **under no circumstances** will forms be accepted from the “Waterloo Walk-in Clinic” in the University Shops Plaza.

**Grievance:** A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department’s administrative assistant who will provide further assistance.

**Discipline:** A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

**Appeals:** A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72, Student Appeals.

**Note for students with disabilities:** AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

**Turnitin.com:** Text matching software (Turnitin®) may be used to screen the term paper in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. The alternative in this course is a written, in-person final exam. It is the responsibility of the student to notify the instructor in the first week of term if they wish to take the alternative final exam.

*We respectfully acknowledge that we work on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometres on each side of the Grand River.*