CONTACT INFORMATION:

- Instructor: Kevin Resch, Office: QNC3127, email: kresch@uwaterloo.ca, phone x38205. I will start with an open door policy for questions and revisit later in the term if necessary.

COURSE DESCRIPTION:

This course covers topics related to the quantized electromagnetic field, its properties, and its interaction with matter. From the calendar:

Field quantization, quantum states of light, coherence and interference, quasi-probability representations, nonlinear optics, light sources, tomography, measurement of light, continuous variable quantum information protocols, cavity QED.

RESOURCES:

Course notes will be provided; there is no required text. Some good general texts include:

- Gerry/Knight Introductory Quantum Optics
- Loudon The Quantum Theory of Light
- Leonhardt Essential Quantum Optics
- Garrison/Chiao Quantum Optics

An extensive bibliography including many original works from the literature will be provided as part of the course notes; you are encouraged to read these papers.

TOPICS:

Topics to be covered will be selected from:

1. Quantization of the electromagnetic field
2. Important quantum states of light and their properties
3. Coherence and Interference
4. Quasi-probability representations of quantum states
5. Continuous-variable quantum optics
6. Sources of light

7. Important applications of quantization

8. Cavity QED

ASSESSMENT:

• **Assessment**: 50% Problem Sets, 50% Presentation (Lecture)

• **Policy on Assignments**:
  - Assignments are due at the beginning of class.
  - Grades for late assignments can be handed in for up to 50% credit until the solutions are posted online. Solutions to problem sets will usually be posted no sooner than 1 week after the due date.
  - Assignments will typically have two sections: marked and unmarked questions. The assignment grade will be based on a subset of questions (possibly all) from the marked section. Solutions to the all questions in the 'marked' section will be provided.
  - A printout of the computer code used in solving a problem must be handed in to receive credit for that problem.
  - **Students are encouraged to discuss assignment problems with their peers, but must write up their own solutions and computer code.** Copying these constitutes a breach of academic integrity.

• **Policy on missed Midterms or Exams**: Missed midterms, presentations, or exams will result in a grade of 0%.

• **Special cases**: Accommodations for missed exams or assignments will be considered only with verified Verification of Illness Forms (VIF).

• Check appropriate uWaterloo websites for details concerning various dates (e.g., final examination, drop deadlines)

ACADEMIC INTEGRITY:

• **Office of Academic Integrity** provides relevant information for students, faculty and staff.
  - **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.

  - **Grievance**: Students, who believe that a decision affecting some aspect of their university life has been unfair or unreasonable, may have grounds for initiating a grievance. Students should read Policy #70, Student Petitions and Grievances, Section 4. When in doubt, students must contact the department's/school's administrative assistant who will provide further assistance.

  - **Discipline**: Students are expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for their actions. Students who are unsure whether an action constitutes an offense, or who need help in learning how to avoid offenses (e.g., plagiarism, cheating) or about 'rules' for group work/collaboration should seek guidance from the course instructor, academic advisor,
or the Associate Dean of Science for Undergraduate Studies. For information on categories of offenses and types of penalties, students should refer to Policy #71, Student Discipline. For information on typical penalties, students should check Guidelines for the Assessment of Penalties.

- **Appeals**: A decision or penalty imposed under Policy 33 (Ethical Behavior), Policy #70 (Student Petitions and Grievances) or Policy #71 (Student Discipline) may be appealed, if there is a ground. Students, who believe they have a ground for an appeal, should refer to Policy #72 (Student Appeals).

**COURSE RULES/CONSIDERATIONS:**

- **Exam Period Travel**:
  - Specify exact exam period dates
  - Recommend when students should start checking for posted exam dates:
    - **For Fall exam dates**, start checking toward the end of October.
    - **For Winter exam dates**, start checking in the middle of February.
    - **For Spring exam dates**, start checking in the middle of June.
  - Student travel plans are not considered acceptable grounds for granting an alternative examination time.

- **Students with Disabilities**:
  - **AccessAbility Services**, located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If students require academic accommodations to lessen the impact of their disability, they should register with AccessAbility Services at the beginning of each academic term.

- **Changes to Course Outlines**:
  - Revised course outlines will be posted/provided, if course details change (e.g., topics covered, emphasis on certain topics, etc.)
  - **Course elements that will not change are the:**
    - Grading scheme
    - Course elements related to evaluation