Physics 435: Current Topics in Condensed Matter Physics

Lectures: TTh, 11:30-12:50.
Room: HH 138.
Instructor: Anton Burkov.
Office hours: open door, PHY 369.
TA: Giacomo Torlai, email: gtorlai@uwaterloo.ca.
Homework: (roughly) weekly.
Grade: homework 30%, midterm 20%, final 50%. Assignments will be posted on LEARN and must be handed in on time to the instructor in class. Late homework will be penalized. Assignments, which are more than one week late, will not be accepted.

Course outline

This class will be focused on electronic properties of solids, with a special emphasis on topics of current interest. The class is self-contained and no prior knowledge of Condensed Matter Physics is necessary. Approximate list of topics that we will cover:

- Introduction: electrons in a periodic potential, metals and insulators.
- Simple one-dimensional solids: polyacetylene. Introduction to the basic notions of the electronic structure topology.
- Two-dimensional solids: Graphene and the Quantum Spin Hall Effect.
- Three-dimensional Topological Insulators.
- Basics of many-body quantum mechanics, second quantization.
- Basics of Magnetism.
- Basics of Superconductivity.

No required textbooks, recommended for reference:


Statement for students with disabilities
The Office for Persons with Disabilities (OPD), 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 you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.

**Statement regarding travel and the final examination period**

Student travel plans are not considered acceptable grounds for granting an alternative examination time.


**Expectation of academic integrity**

To create and promote a culture of academic integrity, the behaviour of all members of the University of Waterloo should be based on honesty, trust, fairness, respect and responsibility.

*Avoidance of Academic Offenses.* 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 professor, TA, academic advisor, or the Undergraduate Associate Dean. For information on categories of offenses and types of penalties, students should refer to Policy #71, Student Academic Discipline, [http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm). Students who believe that they have been wrongly or unjustly penalized have the right to grieve; refer to Policy #70, Student Grievance, [http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm).

**Student grievances**

Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy #70, Student Grievance, [http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm).

**Student appeals**
Concerning a decision made under Policy 33 (Ethical Behaviour), Policy 70 (Student Grievance) or Policy 71 (Student Academic Discipline), a student may appeal the finding, the penalty, or both. Students who believe that they have grounds for an appeal should refer to Policy 71 http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm.