PHYS-A0140

Aalto Physics - Structure of Matter

Introduction to the course

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Take clicker from the front
and register it in MyCourses!
PHYS-A0140 → Lectures → Clicker registration → Add entry

Do you have a clicker?

A. Yes
B. No
C. What's a clicker?
D. I don't know

Registration

- Those who have not registered yet, please register for the course, exercises and small groups for project work.
- In case of problems with registration, contact taru.bister@aalto.fi (note: Taru is this week available only today and Tuesday. Don't wait to contact her.)
- Please check you are registered on MyCourses (https://mycourses.aalto.fi).
- All teaching material will be available on MyCourses. Also, your reports will be submitted there, it is an open forum for course-related discussions with your fellow students and teachers.

Lectures

- Two lectures each week (but not every week!), Mondays 14:15 - 16:00 and Tuesdays 10:15 - 12:00.
- Besides actual lecturing, there will also be activities such as discussions, concept questions, and problem solving during the lectures. Do not expect to just come and listen, you will be put to work – this is what the clickers are for.
- Sit together…you will need to discuss.
- Before each lecture we recommend you to study the book sections mentioned – makes your life easier…

Lectures – Peer instruction

- Interactive teaching
- Student-centered teaching (vs teacher-centered)
- Developed at MIT and used at many universities

Procedure

1. Teacher asks question
2. **Student reflects – individually, no discussion**
3. Student submits answer using clicker
4. Teacher shows group response
5. **Student discusses with peers**
6. Student submits answer using clicker
7. Teacher shows group response
8. Further explanation if needed

Lectures – Peer instruction

Students get more autonomy and responsibility in their own learning

- Reading at own pace before the lecture.

General understanding develops already before coming to lecture.

During lecture, understanding deepens by reflection and discussion.

Lectures – Peer instruction

- Students learn better from other students (peers).
- Those who don't know the answer or are uncertain, will learn from their peers.
- Those who already know the answer, can learn by explaining their thoughts and reasoning
  - it is not necessarily trivial to explain your thoughts in a clear and logic manner.
- If there is disagreement, students will need to develop arguments to convince the other.

Exercises

- Exercise sessions in weeks 17 and 18 on Wednesdays and Thursdays. Attend the session to which you are registered in Oodi.
- The exercise sets are standard and include both mathematical and conceptual tasks.
- For details on submission see MyCourses.

Projects

- Almost 60% of the total points from this course are given by the projects:
- **Project 1** - this is an experimental project about optical diffraction on structured materials.
- **Project 2** - this is a simulation based project that will allow you to build a model of *atomic scale friction* using modern coding techniques. It is the most challenging of the projects and hence receives a higher proportion of the available points.

  Project 2 presentations:
  Tue 28.5 9:00 - 16:00
  Wed 29.5 9:00 - 16:00
  Your group will only be required to attend a single morning or afternoon session with these presentation days.

Grading

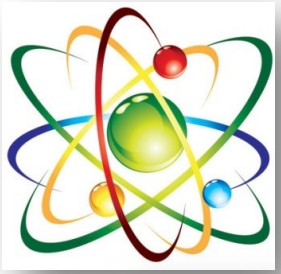
- Projects
  - Experimental project 1 (30)
  - Simulation project 2 (60)
- Exercises (40 – *20+20*)
- Lectures (20) - for answering clicker questions during the exercises, with eventual correct answers getting proportionally higher marks.
- Feedback (5) - completing the online feedback forms for the course.

- 50 % required to pass.

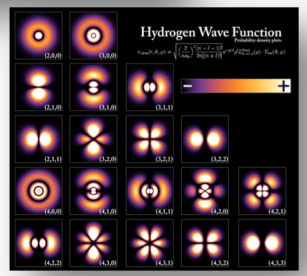
English integration

- Opportunity to get extra credits alongside this course.
- Directly linked to the projects, the dominant contribution to your grades.
- Critical reading and writing skills, analysis, presentation.
- You have to give a presentation at the end of project 2 anyway…

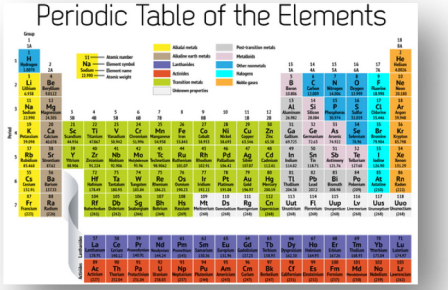
Outline of the course



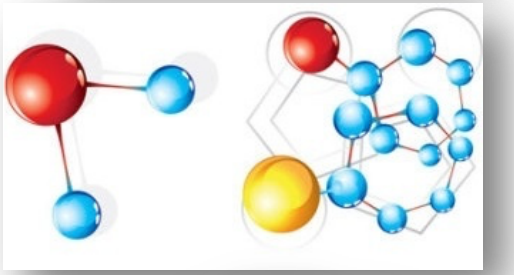
- Build models of an atom, and see how the classical and quantum descriptions fit.

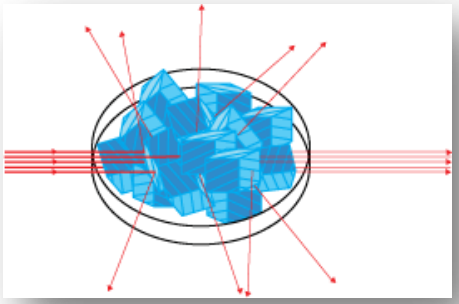


- Explain how the electronic structure of atoms leads to the periodic table.



- Introduce atomic interactions and the physics behind them.





- Bring everything together to look at the structure of real materials at the atomic scale.