

# Solid state structure

Daniele Toffoli

# Outline

- 1 Lectures
- 2 Syllabus
- 3 Grading policy
- 4 Bibliography

1 Lectures

2 Syllabus

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# Lecture hours

The course consists of 48 hrs of lectures, 4hrs per week:

- Mondays 9:00 – 11:00 room A8
- Fridays 9:00 – 11:00 rooms A8

## Contacts

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# Syllabus

## Workplan

### Content of the class

- 1 Intro on crystal lattices
- 2 Mathematical supplement: periodic functions, Fourier series, and waves
- 3 The structure of crystalline solids
  - classification of Bravais lattices and crystal structures
  - the reciprocal lattice
  - determination of crystal structure by X-ray diffraction
- 4 The Drude theory of metals (short overview)
- 5 The Sommerfeld theory of metals: free electron gas model
- 6 Electron levels in a periodic potential: general properties
- 7 Electrons in a weak periodic potential
- 8 Tight-binding and other methods for calculating band structure

# Syllabus

## Workplan

### Content of the class

- 9 Classification of solids
- 10 Cohesive energy

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# Grading policy

Oral exams are evaluated over a 30-point scale.

distribution of dates of oral exams

- January/February (3)
- June/July (4)
- September (2)

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# Bibliography

## Textbooks

- 1 N.W. Ashcroft, and N.D. Mermin, *Solid state physics*, 1st Ed. 1976
- 2 C. Kittel, *Introduction to solid state physics*, 8th Ed. Wiley, 2005

## Other textbooks

- 1 W. A. Harrison, *Solid state theory*, Dover books on physics, 1979
- 2 G. Grosso, G. P. Parravicini *Solid state physics*, Academic press 2003
- 3 E. Canadell, M.-L. Doublet, and C. Iung, *Orbital approach to the electronic structure of solids*, Oxford University press 2012
- 4 Notes from prof. Gabriele Balducci