SOLID-STATE ELECTRONICS

1.1. Identification

University:	Alma Mater Studiorum – Università di Bologna													
School:	School of Engineering													
Course:	Solid-state electronics													
ECTS:	6													
Semester:	*Winter*							*Summer*						X
Category	*Fundamental course*					X		*Specialisation course*						
Module	*MFI*		*MFII*		*MFIII*	X		*MSI*		*MSII*		*MSIII*		
Teachers:	Massimo Rudan													
Language:	*English*	X	*Italian*	X	*Swedish*		*Spanish*							

1.2. Learning-outcomes

- knowledge about the fundamentals of quantum mechanics and band theory of solids
- knowledge about the physical phenomena underlying the transport of charged carriers in solids

1.3. Competencies

- **General**

- To have critical understanding of technical and scientific tools.
- To be able to select and apply numerical TCAD tools.
- Communication skills.
- To be able to work in an international context

- **Specific**

- To understand the methods for investigating advanced solid-state devices.
- To determine the important microscopic and macroscopic parameters involved in the functioning of semiconductor devices.
- To perform numerical analyses of semiconductor devices.

1.4. Contents

1. Introductory part where the basic relations of quantum mechanics are shown.
2. Theory of bands in crystals.

3. Description of the different hierarchical approached to the transport theory.
4. Lattice vibrations.
5. Treatment of the main scattering mechanisms in semiconductors.
6. Absorption of light in semiconductors.
7. Derivation of the macroscopic elastic properties of solids.

1.5. Teaching Methodology

- Lecture sessions.
- Laboratory sessions using TCAD tools.

1.6. Evaluation

- Oral exams, including discussion of the laboratory work.

1.7. Bibliography

D. A. Neamen, *Semiconductor Physics and Devices*, IRWIN, 1992.
S. Datta, *Electronic Transport in Mesoscopic Systems*, Cambridge, 1995.
D. K. Ferry and S. M. Goodnick, *Transport in Nanostructures*, Cambridge, 2001.