



## **Master's program Entrance examination topics**

### **Physics**

1. Principles of classical mechanics: Newtonian and Lagrangian mechanics
2. Principles of thermodynamics: energy, entropy, first and second law of thermodynamics
3. Electrostatics and magnetostatics: electric and magnetic fields, force laws, potentials, current flow
4. Maxwell's equations, important classes of solutions, physics of electromagnetic waves
5. Elements of quantum mechanics: wave-particle duality, Schrodinger equation, measurements in quantum mechanics
6. Operation of solid-state electronic devices: transistors, integrated circuits, LEDs and lasers
7. Principles of optics, operation of basic optical devices (lenses, telescopes, microscopes)

#### **Recommended literature:**

N. Gershenfeld, *The Physics of Information Technology*. Cambridge University Press, 2000.

#### **Further references for Hungarian speakers:**

Simonyi - Zombory: *Elméleti Villamosságtan*. Műszaki Könyvkiadó, 2000.

Csurgay - Simonyi: *Az információtechnológia fizikai alapjai*. Mérnöktovábbképző Intézet, 1997.

### **Electronics**

8. Concentrated parameter circuits, building block of an electrical circuits: linear and non-linear building blocks. Kirchhoff equations, Ohm's law, laws describing current-voltage characteristics of various circuit components.
9. Solution of the circuit equations in time domain and frequency domain, circuit simulator programs.
10. Methods for the analysis of linear circuits in frequency domain.
11. Some problems of Boolean circuit design: logic circuits, logic functions design trade-offs (speed, area, power).
12. Describe the operation of an arbitrary electronic circuit of your choice. Examples include but not limited to: amplifiers, converters (step up/down), microcontroller, LED driver, A/D converter, ALU unit.
13. Overview of microelectronics. Chip design, basics of microelectronics fabrication, fabless microelectronics.

#### **Recommended literature:**

Schultz, Mitchel E. *Grob's basic electronics*. McGraw-Hill, 2011.

Razavi, Behradd: *Fundamentals of Microelectronics*, Wiley, 2007.