Master's degree program
Light Guide Photonics and Programmable Electronics

Entrance examination questions

1. The nature of light. Electromagnetic spectrum. Optical phenomena at the interface of the media.
2. Snell's Law. Total internal reflection.
3. Planar waveguide. Total internal reflection.
4. Optical fiber, its structure and basic characteristics.
5. Birefringence. Birefringence in Optical Fiber.
6. Two-wave interference. Double-slit experiment (Young's experiment).
7. Michelson interferometer and Mach-Zehnder interferometer. The optical scheme and the principle of operation.
8. The concept of diffraction. Fresnel diffraction and Fraunhofer diffraction.
9. Fiber Bragg gratings.
10. Rayleigh and Raman scattering of light.
11. Why does modern digital electronics base on the binary notation?
12. What is the difference between compiled and interpreted programming languages?
13. What is the difference between analog, digital and discrete signals?
14. What is the difference between strong and weak typing in programming languages?
15. Give definitions for the following terms: microcontroller, integrated circuit, processor, system-on-chip, FPGA.
16. What is OSI (Open Systems Interconnection) model? What is a compilation? What are the main steps of C/C++ programs compilation process?
17. What is a cross-platform development? Main cross-platform providing solutions.
18. TCP/IP protocols stack.
19. What is a Domain Name System (DNS)?
20. Hierarchical structure of DNS.
21. The principle of negative feedback in amplifiers and tracking systems.
22. The principle of operation, current-voltage and watt-ampere characteristics of photodiodes.
23. The light-emitting and laser diodes: operation principle, current-voltage and watt-ampere characteristics.
24. Operation principles of bipolar and field-effect transistors.
25. Operation principles and properties of operational amplifiers.
26. Convolution of discrete signals.
27. Fourier transform (continuous).
28. Discrete Fourier transform.
29. Digital filtering: FIR (finite-impulse response) filters; zeros of its transfer function.
30. Digital filtering: IIR (infinite-impulse response) filters; zeros and poles of its transfer function.