

### Information specialization:

1. Pixel level transformations in digital images: Look-Up Table, brightness, contrast, negative, gamma-correction, contrast-stretching, clipping, thresholding, histogram, cumulative histogram, histogram-based transformations, histogram equalization
2. Spatial or neighbourhood image processing techniques: Convolution, kernels, boundary conditions, low-pass filters (smoothing), high-pass filters (edge detection, edge enhancements), Prewitt, Sobel, Laplace, Canny edge detection, rank filters
3. Morphological Image Processing: Structuring elements (templates), shape of structuring elements, transformations, erosion, dilation, opening, closing, hit-and-miss, connectivity, applications.
4. Describe the architecture of PLA devices, and show and discuss its schematic diagram. Give an example for synthesising a minterm list on a PLA architecture. Describe the PAL devices and present an example design with them using a minterm list.
5. Describe the main architectural drawbacks of the PLA and PAL devices. Describe the GAL and CPLD devices. Talk about the importance and structural elements of the macro cell. Tell about the main fields of use of GAL and CPLD devices and the reason behind their disadvantages.
6. Talk about the architecture of FPGAs. Describe the input/output banks, combinational logic blocks, and the purpose and importance of switch matrices.
7. Talk about hardware description languages. Describe them in detail stating their main properties and area of use. Discuss the role of hardware description languages in the modern digital design flow.
8. Describe the traditional and modern digital design flows. Talk about the main differences between and what is the purpose of hardware description languages in the modern design flow.
9. Describe typical filter types: Analog filter types and their characteristics. The importance of linear phase response. Digital Fir filter topology, impulse response, phase response, filter parameters. Structure and characteristic properties of the IIR filter. Describe application examples.
10. Describe the types and characteristics of the Fourier transform: Fourier series, Fourier transform, Discrete-time Fourier transform, Discrete Fourier transform. Introduce the fast Fourier transform. Describe application examples.
11. Size-dependent parameters of electronic materials. Problems of size reduction in electronics. Development trends of microelectronics and technology, Moore's law.
12. Top-down methods.
13. Bottom-up methods.
14. Production of thin films by PVD methods: types, advantages, disadvantages, application possibilities.
15. Examination of the properties of thin layers using different methods.
16. Technology of plasmonic elements, parameters and their applicability.
17. Types, technology, and application of optical fibers in telecommunications.

18. Optical windows, filters: types, materials, parameters, applications.
19. Light sources: types, materials, parameters, applications.
20. Solar cells: types, materials, parameters, applications.