Thematic Topics for the Master Final State Exam
Master study program Communication, Multimedia and Electronics

Common Theoretical Part

1. Probability, independent events, Bayes' formula, random variable, distribution function, quantile function, moments, transformations of random variables, random vector. (A2M01PMS)

2. Covariance, correlation. Chebyshev's inequality, law of large numbers, central limit theorem. (A2M01PMS)

3. Random sampling, statistics, point and interval estimates, tests of hypotheses, testing of goodness of fit. (A2M01PMS)

4. Linear and cyclic convolution, signal segmentation and synthesis, properties of DFT, windowing, consequences of quantization. (AE2M99CZS)

5. Resampling, filter banks, estimation of random signal characteristics, spectral and correlation analysis, signal modelling and linear prediction. (AE2M99CZS)

6. Computer architectures (Von Neumann, Harvard). Memories, busses. Address and I/O space of the processor, run-time reconfiguration. On-chip peripherals, I/O space extension. Instrument and communication busses, multiprocessor communication. (AE2M99MAM)

7. Processor programming, machine code, assembly language, high-level languages, interrupt system, pipeline. Programming techniques, multiprocessor systems, parallel programming. (AE2M99MAM)

8. Properties of digital modulations. Input/Output model of communication channel, likelihood function. Demodulator, metrics (correlation, signal space, SODEM) Communication channel sharing. (A2M37DKM)

9. Block and convolution codes, matrix description, properties. Coding in constellation space. Viterbi algorithm. Space-Time Coding, turbo codes and LDPC principles. Detection error rate. (A2M37DKM)

10. Architecture of wireless networks, mobile networks, frequency planning, allocation of radio resources, radio access methods, optimization of data transmissions at physical and data link layer, handover, power control. (A2M32MKS)

11. Mesh and Ad-hoc networks, generation of mobile networks, WLAN and WMAN, convergence of wired and wireless networks. (A2M32MKS)

12. Analogue and Digital integrated systems design methodology. IC manufacturing process; CMOS technology, IC technology trends, IC layout and design rules. (AE2M34SIS)

13. MEMS technology; polymer technologies, optoelectronic integrated circuits and systems - technology process, design and properties of optoelectronic ICs. (AE2M34SIS)

14. Parameters of antennas, antenna types - line, loop, slot, micro strip. Horn, reflector antennas, lenses, wideband antennas, antenna arrays. Measurement of antennas. (A2M17AEK)

15. Electromagnetic interference, jamming, types of coupling, anti-jamming elements. Electromagnetic screening, Electromagnetic resistance. Hygienic standards. (A2M17AEK)

Thematic Areas
Branch Communication Systems

1. Fixed and satellite link, long-wavelength, medium-wavelength, short-wavelength link, connection via a tropospheric wave. Coverage for mobile and satellite systems - planning. (A2M17PDS)

2. Interference in directional links and in cell nets. Measurement methods of radio links and nets. Adaptive systems and future radio communication services. (A2M17PDS)

3. Methods of pre-processing of image information. Compression methods of video signals and multimedia transmission standards. Methods of image reconstruction. (A2M37OBT)

4. Special optical imaging systems (3D systems, polygraphy and applications). (A2M37OBT)

5. Basic characteristics of speech and speech signal. Temporal characteristics - energy, intensity, zero crossing. Spectral characteristics - DFT and LPC spectrum. (A2M31ZRE)

6. Phonetical aspects - vocality, model of speech production. Influence of noise on speech signal - additive and convolution noise. Possibilities of suppression. (A2M31ZRE)

7. Application of voice technology in real systems. Principles of speech recognition with small and big vocabulary. Speech synthesis - basic approach. Multimedia systems with voice technology. Hearing aids and cochlear implants. (A2M31ZRE)

8. Microsystems and structures, energy domains, reliability, microsystem technologies including MEMS. (AE2M34MST)

9. System integration (digital and analogue systems), smart structures and systems, components for electronics and informatics. (AE2M34MST)

10. Micro actuators, micro handlers, micro drives and sensors, MEMS. Physical principles (electronic, magnetic, optical, chemical, thermal, mechanical). (AE2M34MST)

11. Switching system, switching equipment - switching field, subscriber sets, switching line, trunks, tone generators, diagnostics, control of digital switching system. (A2M32RKP)

12. SS7 signalling - message routing, SCCP, TCAP, ISUP MAP protocols. (A2M32RKP)