<table>
<tr><td colspan="3">Institute of Cyberphysical Systems
Software Engineering Institute</td><td colspan="4">4th semester of the curriculum
2026-27-1</td></tr>
<tr><td rowspan="2">Name of the subject:</td><td rowspan="2">Code of the subject:</td><td rowspan="2">Credits:</td><td colspan="4">Weekly hours:</td></tr>
<tr><td></td><td>lec</td><td>sem</td><td>lab</td></tr>
<tr><td>Comprehensive Exam</td><td>NBXSS1EBNF</td><td>0</td><td>fulltime</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="3">Responsible person for the subject: Prof. Dr. Levente Kovács</td><td colspan="4">Classification: professor</td></tr>
<tr><td colspan="7">Subject lecturers: Dániel Kiss, Dr. Mehdi Taassori, Dr. László Csink</td></tr>
<tr><td>Prerequisites:</td><td colspan="6">Algorithms and data structures [NSXAA1EBNF], Digital systems [NKXDR1EBNF], Electronics [NKXEL1EBNF]</td></tr>
<tr><td>Way of the assessment:</td><td colspan="6">Exam</td></tr>
<tr><td colspan="7">Course description</td></tr>
<tr><td>Goal:</td><td colspan="6">The comprehensive exam serves as a milestone before students begin their specialization, ensuring that they organize and consolidate the professional, engineering, and programming knowledge acquired during the first two years.</td></tr>
<tr><td>Topics:</td><td colspan="6">The knowledge required to successfully complete the comprehensive exam is based on the topics covered in the following courses: Electronics Basic, Electronics, Digital Systems, Problem-solving using programming, Basics of Software Development, and Algorithms and data structures.

Topics from Electronics and Digital Systems subject group
• Charge and Current, Voltage, Power and Energy
• Resistance, Capacitors, Inductors, Conductance, Ohm’s Law, Kirchhoff’s Laws
• Voltage Division, Current Division
• Superposition, Source Transformation, Thevenin’s Theorem, Norton’s Theorem
• Phasor Relationships for Circuit Elements, Impedance and Admittance, Impedance Combinations
• Diodes, DC Power Supply, Rectifier Circuits, Limiting and Clamping Circuits
• Bipolar Junction Transistors (BJT), BJT Modes of Operation, Current–Voltage Characteristics
• Configurations of BJT, Transistor as a Switch
• Operational Amplifiers, Function and Characteristics of the Ideal Op Amp, Differential & Common Mode Signals
• Op Amp with Negative Feedback, Inverting and Non-Inverting Configuration
• Op Amp: Closed loop Gain, Input & Output Resistances
• Difference Amplifiers, Integrators and Differentiators
• MOS Field-Effect Transistors (MOSFETs), Current–Voltage Characteristics
• Biasing in MOSFET, Configurations of MOSFET, MOSFET Transistor as a switch
• Binary Arithmetic, Boolean Algebra, Karnaugh Map
• Decoder and Encoder, Multiplexer and Demultiplexer
• Combinational Logic Circuits, Adder, Ripple Carry Adder, Subtractor, Multiplier
• Sequential Logic Circuits, Flip Flops, D Flip Flop, SR Flip-Flop, JK Flip-Flop, T Flip-Flop
• Analysis of Sequential Circuit, State Table, State Diagram, Timing</td></tr>
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	Chart • Registers, Shift Register **Topics from Programming subject group** • Objectoriented programming • Basic algorithms for array operations • Sorting algorithms • Sorted arrays (binary search, union and intersection operations) • Divide and conquer algorithms (merge sort, quicksort) • Dynamic programming and backtracking (algorithms solving the 0-1 knapsack problem) • Linked data structures and their operations (stack, queue, list, priority queue) • Binary search tree and its operations • Hash functions, dictionary implementations, and their operations • Graph algorithms (breadth-first and depth-first search, shortest path finding)

Type of the exam
The exam consists of an entry test and a written section. The entry test involves solving a programming task in C# in a computer lab. Only candidates who successfully pass the entry test are allowed to participate in the written section. In the written section, students must first complete tasks related to the Electronics and Digital Systems subject group, followed by tasks related to the Programming subject group.
Calculation of the exam mark
To achieve a passing grade on the comprehensive exam, a minimum of 50% must be attained in both subject groups of the written section. The final exam grade is determined based on the average percentage achieved across the two subject groups, according to the following thresholds. 0 – 49: Fail (1) 50 – 61: Pass (2) 62 – 73: Satisfactory (3) 74 – 85: Good (4) 86 – 100: Excellent (5) Based on prior academic performance, students may complete the comprehensive exam with an offered grade if they have achieved at least a Good (4) in all of the following courses. • Electronics [NKXEL1EBNF] • Digital Systems [NKXDR1EBNF] • Problemsolving using programming [NSXPP1EBNF] • Basics of Software Development [NSXSFAEBNF] • Algorithms and data structures [NSXAA1EBNF] The offered comprehensive exam grade is determined as the arithmetical mean of the grades from these five subjects, following standard rounding rules. Students who have fulfilled any of these courses through accreditation from previous studies are not eligible for an offered grade.