Preliminary syllabus

	Advanced Computer Science Skills		Girls in IT
Online selection (August 2024)	1. Introduction to Game Theory (Dynamic Programming, Graph-Based Dynamic Programming, Retroanalysis) 2. Matching in Bipartite Graphs 3. Cartesian Trees 4. Implicit Cartesian Trees 5. Suffix Arrays 6. Trie Data Structures + Online competition		1. Python syntax, type conversion, arithmetic operations 2. Logic, conditional statements, while loop in Python 3. Logical operations and quantifiers in mathematics 4. For loop, lists, tuples, indexing and slicing in Python 5. Sequences and patterns in mathematics 6. Functions in Python
Onsite Boot Camp in Baku (September 2024)	**Division 1** 1. Advanced Game Theory (Sprague-Grundy Theorem, Minimum EXcludant (MEX), XOR Operations) 2. Fast Fourier Transform (FFT) 3. Non-Thematic Contest (Intersects with Division 2) 4. Maximum Flow Algorithms 5. Minimum-Cost Maximum-Flow Algorithms 6. Non-Thematic Contest (Intersects with Division 2) 7. Convex Hull Trick and Li-Chao Tree (Combined with Division 2) 8. Suffix Automata 9. Palindromic Trees 10. Non-Thematic Contest (Intersects with Division 2)	**Division 2** 1. Geometry: Points, Vectors, Dot/Cross Product, Angles, Lines, Circles 2. Geometry: Polygons, Area Calculations, Point in a (Convex) Polygon, Convex Hull 3. Non-Thematic Contest (Intersects with Division 1) 4. Dynamic Programming Optimizations (Divide & Conquer, Knuth Optimization, Alien Trick) 5. Lazy Propagation in Segment Trees 6. Non-Thematic Contest (Intersects with Division 1) 7. Convex Hull Trick and Li-Chao Tree (Combined with Division 1) 8. Chinese Remainder Theorem, Euler's Totient Function 9. Persistent Data Structures 10. Non-Thematic Contest (Intersects with Division 1)	1. Strings in Python 2. Dictionaries and Sets in Python 3. Sets in mathematics and the Pigeonhole Principle 4. Libraries in Python 5. Object-Oriented Programming in Python 6. Knights and Knaves 7. Mathematical induction 8. Estimating limitations 9. Symmetry in mathematics 10. Analysis from the end
Online Course (September-November 2024)	1. Aho-Corasick Algorithm 2. Generating All Combinatorial Objects: Enumeration, Generating Next/Previous Object 3. Binary Indexed Tree (BIT) 4. Advanced Dynamic Programming Techniques 5. 2D Query Processing with Segment Trees and Sweep Line Algorithms 6. Advanced SQRT Decomposition and Mo's Algorithm 7. Matrix-Based Dynamic Programming 8. 3D Geometry Techniques and Applications		1. Elementary functions asymptotics 2. Complexity in terms of Big-O, examples of Bubble Sort and Binary Search algorithms 3. Reduction in mathematics 4. Descent method 5. Recursion 6. Various sorting algorithms 7. Various search algorithms 8. Huffman code