

## Program:

### Elements of Number Theory and Algebra

1. The functions of integer modular arithmetic, ceiling and floor operations rounding  
real mergesort algorithm. (2 hours.)
2. asymptotics numerical functions, taking into account in estimating the complexity of applications  
time algorithms. (2 hours.)
3. Severability numbers, Euclid's algorithm. (2 hours.)
4. Fibonacci Numbers. (1 h).
5. Prime and relatively prime. Factorization. Euler function. Latin squares.  
Chinese remainder theorem. Euler's theorem (4 hours).

### Combinatorics

1. Deployment, permutations, combinations connectors (harvesting number) Lemma Burnside. (4 hours).
2. Methods of generating combinatorial objects simple. (2 hours.)
3. Examples of simple problems recursively defined. (2 hours.)
4. Solving equations recursive generating functions. (4 hours).
5. Catalan number. (1 h).
6. The principle of switching on and off. (2 hours.)

### Graph Theory and ordered sets

1. Relationships order and equivalence and examples. (1 h).
2. The extension line of ordered sets - application in the construction of algorithms  
sorting. (1 h).
3. The definitions and examples of the bars, the bars of separate and Boolean algebra. (2 hours.)
4. The definition and examples of graphs, charts full bipartite directed, the degree of vertex. (2 hours.)
5. Roads and cycles in graphs: bipartite graphs and consistent. (1 h).
6. Trees - equivalence of different definitions. (1 h).
7. Computer representation of graphs. (1 h).
8. Methods of BFS and DFS graph search. (2 hours.)
9. Minimum spanning tree - algorithms and Kruskal-Prima Dijkstra. (2 hours.)
10. Transitive Closure: Dijkstra's algorithm and Warshall. The complexity of the problem. (3 hrs.)
- 11 cycles and the Euler path. (1 h).
- 12 cycles and expensive Hamilton theorem. Ore and polynomial reduction of the problem to the cycle path and vice versa. (2  
h.)
13. The planar graphs. Tw. Euler and Kuratowski. (3 hrs.)
14. Coloring graphs: application - planning the examination session. And sequential algorithm  
Theorem 5-coloring planar graphs. (2 hours.)

## Elements of probability

### 1. The space of elementary events, events in discrete probability

Event spaces. (2 hours.)

### 2. The conditional probability and the probability formula for complete. Bayes' formula. (2 h.)

### 3. Independence of events. Bernoulli scheme. (2 hours.)

### 4. Random variables, expected value and variance. The law of large numbers. (2 hours.)

### 5. The probability events in the continuous areas. Normal distribution. (2 hours.)