JSC «Kazakh-British Technical University»
Faculty of Information Technology
Chair of Information Systems Management

APPROVED BY
Dean of FIT
Suliev. R. N. _____
«____»_____ 20__

SYLLABUS

Discipline: ACM ICPC I
Number of credits: 3 (2/0/1)
Term: _____ 20__
Instructor's full name:

Personal Information about the Instructor	Time and place of classes		Contact information
	Lessons	Office Hours	e-mail
Alimzhan Amanov	According to the schedule	According to the schedule	a.amanov@kbtu.kz

Course duration: 3 hours a week, 15 weeks
Course prerequisites:
Course Objective:

This course is designed to teach efficient use of data structures and algorithms to solve problems. Students study the logical relationship between data structures associated with a problem and the physical representation. Topics include introduction to algorithms and data organization, arrays, stacks, queues, single and double linked lists, trees, graphs, internal sorting, hashing, and heap structures. Hands-on exercises are required.

Course Goals:

Develop computer programming and debugging skills in building projects with abstract data types.

We assume that after successful completion of this course students will be able:

- to solve problems using some existing (or developing new) algorithms or data structures
- analyze algorithms in terms of efficiency, complexity etc.
- develop implementation skills in algorithms and data structures
- Be able to pass interview on ease

Literature:

Required:

1. Introduction to Algorithms. 2nd ed. Cambridge by Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. MA: MIT Press.

2. Instructor's notes.
3. Informatics. Data structures, sorting and searching : Handbook / Dusembayev Anuar, - 2nd ed. - Алматы : Dair, 2012. - 201c. (available in the library)

Supplementary:

4. Michael Goodrich, Roberto Tamassia. Data Structures and Algorithms in Java. 4th edition. John Wiley & Sons, Inc. USA. 2006. (available in the library)
5. Data Structures: A Pseudocode approach with C, 2nd edition by Gilberg & Forouzan, Course Technology, 10/2004 (available in library)

Online sources:

1. **informatics.mccme.ru (online judge system and educational content)**
2. **e-maxx.ru/algo (educational content)**

Methodology:

Class discussion, class assignments, A/V presentation, real-life experience, classroom exercises, and self-study.

COURSE CALENDAR

W	Class work	
	Topic	**Seminars and TSIS**
1	**L1. Course introduction and review.** Complexity, Memory	**TSIS 1**
2,3	**L2. Number theory** Factorization, Eratosphene sieve, linear sieve Extended Euclid, modular arithmetic	**TSIS 2**
4,5	**L3. Dynamic programming** 1D dp, 2D dp Knapsack, LCS	**TSIS 3**
5,6	**L4. Data structures** RMQ, RSQ Prefix sum, sqrt-decomposition segment tree	**TSIS 4**
7	**L5. Combinatorics** Counting formulas: factorial, binomial coefficient Generation of combinatorial objects: permutations, correct bracket sequences, binary codes	**TSIS 5**
8,9	**L6. Graphs: Undirected graphs** dfs, bfs typical problems	**TSIS 6**

	In\out time, bridges and cutpoints	
10	**L7. Graphs: directed graphs** Oriented graphs, DAG, Topological sorting, strongly connected components	**TSIS 7**
11	**L8. Graphs: shortest path problems** BFS, Dijkstra algorithm, Floyd, Ford-Bellman	**TSIS 8**
12	**L9. Trees** Tree traversal, LCA, tree query problems	**TSIS 9**
13	**L10. Minimum spanning tree problem** Disjoint Set Union, Prim and Kruskal algorithms	**TSIS 10**
14	**L11. String algorithms.** Z-function, Prefix function, hases	**TSIS 11**
15	**L12. Greedy algorithms** Basic greedy algorithms proof techiches, greedy by sort	**TSIS 12**
16	**Exam.** Test questions.	

COURSE ASSESSMENT PARAMETERS

Type of activity	Final scores
Quizzes	80%
TSIS	0%
Final exam	20%
Total	**100%**

Criteria for evaluation of students during semester:

	Assessment criteria	Weeks															Total scores
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1.	Quizzes				*				*				*			*		80%
2.	TSIS	*	*	*		*	*	*		*	*	*		*	*			0%
3.	Final exam																*	20%
	Total																	**100%**

Academic Policy

KBTU standard academic policy is used.

- Cheating, duplication, falsification of data, plagiarism, and crib are not permitted under any circumstances!
- Attendance is mandatory.

Attention. Missing 20% attendance to lessons, students will be taken from discipline with filling in F (Fail) grade.

Students must participate fully in every class. While attendance is crucial, merely being in class does not constitute "participation". Participation means reading the assigned materials, coming to class prepared to ask questions and engage in discussion.

- Students are expected to take an active role in learning.
- Written assignments (independent work) must be typewritten or written legibly and be handed in time specified. Late papers are not accepted!
- Students must arrive to class on time.
- Students are to take responsibility for making up any work missed.
- Make up tests in case of absence will not normally be allowed.
- Mobile phones must always be switched off in class.
- Students should always be appropriately dressed (in a formal/semi-formal style).
- Students should always show tolerance, consideration and mutual support towards other students.