KAZAKH-BRITISH TECHNICAL UNIVERSITY

KBTU

JSC «Kazakh-British Technical University»
School of IT and Engineering

SYLLABUS

Discipline: Algorithms and Data Structures
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**
Askar K. Akshabayev	According to the schedule	According to the schedule	a.akshabaev@kbtu.kz
Beisenbek M. Baisakov	According to the schedule	According to the schedule	b.baisakov@kbtu.kz
Alimzhan Amanov	According to the schedule	According to the schedule	a.amanov@kbtu.kz
Askhat T. Yergaliyev	According to the schedule	According to the schedule	a.yergaliyev@kbtu.kz
Yerlan Sharipov	According to the schedule	According to the schedule	y.sharipov@kbtu.kz
Assylzhan A. Izbassar	According to the schedule	According to the schedule	a.izbassar@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 organisation, 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
- analyse algorithms in terms of efficiency, complexity etc.
- develop implementation skills in algorithms and data structures

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. Data Structures and Algorithms. School of Computer Science University of Birmingham, Birmingham, UK by John Bullinaria
3. Informatics. Data structures, sorting and searching : Handbook / Dusembayev Anuar, - 2nd ed. - Алматы : Dair, 2012. - 201c. (available in the library)

Supplementary:
5. Michael Goodrich, Roberto Tamassia. Data Structures and Algorithms in Java. 4th edition. John Wiley & Sons, Inc. USA. 2006. (available in the library)

6. 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	**Reference Resource <book>.Chapter N**	**Seminars and TSIS**
1	**Lecture 1.** Complexity and Memory Prime factorization GCD, Sieve of Eratosthenes Stack Queue Deque	**<2>. Chapter 5** **<1>. Chapter 31** **<2>.Chapter 3**	**TSIS 1**

2	**Lecture 2.** Stack Queue Deque Linked lists Doubly-Linked lists	**<2>.Chapter 3**	**TSIS 2**
3	**Lecture 3.** Binary search	**<2>.Chapter 4**	**TSIS 3**
4	**Lecture 4.** Binary search tree	**<2>.Chapter 7**	**TSIS 4** **Quiz 1**
5	**Lecture 5.** Priority queues, Heap	**<2>.Chapter 8**	**TSIS 5**
6	**Lecture 6.** Heap sort Quick Sort	**<2>.Chapter 9**	**TSIS 6**
7	**Lecture 7.** Merge sort	**<2>.Chapter 9**	**TSIS 7**
8	**Midterm**		**Quiz 2**
9	**Lecture 8.** Hash tables Rabin-Karp algorithm based on hash calculation	**<2>.Chapter 10** **<2>.Chapter 4**	**TSIS 8**
10	**Lecture 9.** Knuth-Morris-Pratt algorithm	**<2>.Chapter 4**	**TSIS 9**
11	**Lecture 10.** Adjacency list and matrix Edge list BFS	**<2>.Chapter 11**	**TSIS 10**
12	**Lecture 11.** DFS Topological Sort	**<2>.Chapter 11**	**TSIS 11** **Quiz 3**
13	**Lecture 12.** Spanning tree algorithms (Kruskal, Prima)	**<2>.Chapter 11**	**TSIS 12**
14	**Lecture 13.** Dijkstra Floyd Ford Bellman	**<2>.Chpater 11**	**TSIS 13**
15	**Endterm**		**Quiz 4**

| 16 | Exam | | - |

COURSE ASSESSMENT PARAMETERS

Type of activity	Final scores
Labs	12%
Quiz 1	12%
Quiz 2 (Midterm)	12%
Quiz 3	12%
Quiz 4 (Endterm)	12%
Final exam	40%
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.	TSIS	*	*	*	*	*	*	*		*	*	*	*	*	*			12%
2.	Quizes				*				*				*			*		48%
3.	Final exam																*	40%
	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 30% 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.