KBTU KAZAKH-BRITISH TECHNICAL UNIVERSITY

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

APPROVED BY
Dean of SITE
Azamat Imanbayev
«____» _____ 20 25

SYLLABUS

Discipline: Algorithms and Data Structures
Course code – CSCI2105
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
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
Yerlan Kuzbakov	According to the schedule	According to the schedule	y.kuzbakov@kbtu.kz
Zhandos Zhanabekov	According to the schedule	According to the schedule	Z.zhanabekov@kbtu.kz

Course duration: 3 hours a week, 15 weeks
Course prerequisites: CSCI1103 Programming Principles 1, CSCI1102 Discrete structures

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)
4. Introduciton to Algorithms, Sedgewick

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.

Grade		Achievement percentage	Assessment criterion
«Excellent»	A	95-100%	This grade is given when the student: demonstrated a complete understanding of the course material; did not make any errors or inaccuracies; completed control and laboratory work in a timely and correct manner, and submitted reports on them; demonstrated original thinking; submitted control quizzes on time and without any errors; completed homework assignments; engaged in research work; independently used additional scientific literature in studying the discipline; was able to independently systematise the course material.
	A -	90-94%	
«Good»	B+	85-89%	This grade is given when the student: Has mastered the course material at no less than 75%; Did not make gross errors in responses; Timely completed control and laboratory work and submitted them without fundamental remarks; Correctly completed and timely submitted control tests and homework assignments without fundamental remarks; Utilized additional literature as indicated by the instructor; Engaged in research work, made non-fundamental errors and fundamental errors corrected by the student; Managed to systematise the course material with the help of the instructor.
	B	80-84%	
	B-	75-79%	
	C+	70-74%	
«Satisfactory»	C	65-69%	This grade is given when the student: Has mastered the course material no less than 50%;
	C-	60-64%	

	D+	55-59%	Required assistance from the instructor when completing control and laboratory work, homework assignments; Made inaccuracies and non-fundamental errors when submitting control tests; Did not demonstrate activity in research work, relied solely on the educational literature indicated by the instructor; Experienced more difficulty in systematising the material.
	D	50-54%	

Professor of SITE **Askar K. Akshabayev**

Minutes#1 of the School of Information Technology and Engineering meeting on August 18, 2025