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

APPROVED BY
Dean of SITE
Azamat Imanbayev

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«_____»_____ **2025**

SYLLABUS

Discipline: Algorithms and Data Structures
Course code - CSCI 2015
Term: Spring 2024
Instructor's full name**: Kaster Nurmukan**

Personal Information about the Instructor	Time and place of classes		Contact information	
	Lessons	**Office Hours**	Tel	**e-mail**
Kaster Nurmukan	According to the schedule	According to the schedule	MS teams Join Code : 90vjgel	k.nurmukan@kbtu.kz

MS TEAMS LINK

https://teams.microsoft.com/l/team/19%3A_9c3c_xjitekeb7kt7v53ux-11ajBvYHI9lBWNUv
XZg1%40thread.tacv2/conversations?groupId=d440b67c-e72c-4831-8f51-ffd3b9c9e36b&ten
antId=57081b5e-e66a-4993-8eaf-15b0b309293f

Course duration: 3 credits, 15 weeks, 45 class hours
Course prerequisites: PP1(PP2 optional)
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 Stack Queue Deque	**\<2\>. Chapter 5 \<1\>. Chapter 31 \<2\>.Chapter 3**	**TSIS 1**
2	**Lecture 2.** 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**
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**		-
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 &DFS Topological Sort	**<2>.Chapter 11**	**TSIS 10**
12	**Lecture 11.** Spanning tree algorithms (Kruskal, Prima)	**<2>.Chapter 11**	**TSIS 11**
13	**Lecture 12.** Dijkstra Floyd Ford Bellman	**<2>.Chpater 11**	**TSIS 12**
14	**End-term**		-
15	*Conclusion & Final consultation*		

COURSE ASSESSMENT PARAMETERS

Type of activity	Final scores
Labs defend	12%
Quiz1	16%
Midterm	16%
Endterm	16%
Final exam	40%
Total	**100%**

Criteria for evaluation of students during semester:

	Assessment criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total scores
1	attendance	*	*	*	*	*	*	*		*	*	*	*	*				
2.	labs		*	*	*	*	*	*		*	*	*	*	*				12%
2.	Quiz1				*													16%
3	Mid-exam									*								16%
4.	Endterm														*			16%
5.	Final exam																*	40%
	Total																	100%

Class sessions – will be a mixture of information, discussion and practical application of skills.

Practice – will reinforce the students knowledge by practical appliance of lectured materials.

In-class assessment – will prepare students for their mid-term and final assessment and identify the competence level they have achieved on a related subject matter, the aim being to diagnose potential discrepancies in students' understanding and performance in order to make specific adjustments to the course content and procedures and/or to assign additional assignments to certain individuals or the whole group.

TSIS (Teacher Supervised Student Independent Study) – student self-made project.

Mid-term/End-term test – a diagnostic test used to identify the students' progress, their strengths and weaknesses, intended to force student to prepare for Final Exam. It includes computer based test. also might include open question and Pseudocode question as well

Final examination – 1) an attainment test designed to identify how successful the students have been achieving objectives.

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.