HASAN KALYONCU UNIVERSITY
Faculty of Engineering
Course Description Form

COURSE: Data Structures and Algorithms II				
CODE: SENG202	**SEMESTER**: SPRING			
LANGUAGE: ENGLISH	**TYPE**: COMPULSORY			
PRE-REQUISITES: CENG112	**THEORY**	**PRACTICAL**	**CREDIT**	**ECTS**
WEEKLY HOURS:	3	2	4	6

CONTENT OF THE COURSE:
Definition and properties of Algorithms. Design, analysis, and representation of Algorithms. Recursive algorithms and associated recurrence relationships. Deeper look at sorting, hash, and heap algorithms. Graph algorithms. Design paradigms for algorithms: Brute-Force (Exhaustive Search), Greedy algorithms, Divide-and-Conquer, Dynamic Programming, Backtracking algorithms and randomized algorithms.

OBJECTIVE OF THE COURSE:
The main objective of this course is to provide knowledge on design and analysis of algorithms and associate data structures using C++ programming language. In addition, the course aims at: The fundamental design, analysis, and implementation of basic data structures and algorithms; The analysis and evaluation of the algorithms needs of particular problems; The design, analysis, and implementation of C++ programs by using basic data structures and algorithms.

WEEKLY SCHEDULE	
Week	**Topics**
1	Design, analysis, and representation of Algorithms.
2	Mathematical Foundations: Growth of functions, asymptotic notations.
3	Study of recursive algorithms and associated recurrence relations
4	Hashing algorithms
5	Heap sort algorithms
6	Graph algorithms: shortest path, minimum spanning tree
7	Graph algorithms: Network flow, depth first search
8	Midterm
9	Brute-Force (Exhaustive Search), Greedy algorithms
10	Divide-and-Conquer
11	Dynamic Programming
12	Backtracking algorithms
13	randomized algorithms, NP hard, and NP-complete problems
14	Final Review

TEXTBOOK:

- Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition, 2014.

REFERENCE BOOKS:

1. Introduction to ALGORITHMS, 3rd edition, MIT Press, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest.
2. Data Structures Through C in Depth , 2nd edition, BPB Publications, by Srivastava S. K.
3. The C++ programming language / Bjarne Stroustrup.—Fourth edition.

EVALUATION SYSTEM:		
IN-TERM STUDIES	**QUANTITY**	**PERCENTAGE (%)**
Midterm Exam	1	20
Lab	13	25
Quiz	2	10
Final Exam	1	45
TOTAL	19	100
CONTRIBUTION OF INTERM STUDIES TO OVERALL GRADE	18	55
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	45
TOTAL	19	100

COURSE CATEGORY:	**PERCENTAGE (%)**
Mathematics and Basic Sciences	30
Engineering	20
Engineering Design	45
Social Sciences	5

TABLE OF ECTS / WORKLOAD:			
Activities	**QUANTITY**	**Duration (Hour)**	**Total Workload**
Course Duration	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	6	84
Laboratory works	12	2	24
Lab reports homework	12	2	24
Mid-term	1	2	2
Final examination	1	2	2
Quiz	2	2	4
Total Work Load	**42**	**27**	**182**
Total Work Load / 30			**6,06**
ECTS Credit of the Course			**6**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
LO1	3	3	3	3	2	0	0	1	0	0	0
LO2	3	3	3	3	2	0	0	1	0	0	0
LO3	3	3	3	3	2	0	0	1	0	0	0
LO4	3	3	3	3	2	0	0	1	0	0	0
	PO: Program Outcomes | LO: Learning Outcomes Values: 0: None | 1: Low | 2: Medium | 3: High										

INSTRUCTOR(S):	Asst. Prof. Dr. Abdul Hafiz ABDULHAFIZ
FORM PREPARATION DATE:	7/10/2020

LEARNING OUTCOMES OF THE COURSE:	**PROGRAM OUTCOMES:**
LEARNING OUTCOMES OF THE COURSE: **LO1**: Apply advance C++ programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for particular problems; **LO2**: Design and implement abstract data types such as linked list, stack, queue and tree by using C++ as the programming language using static or dynamic implementations; **LO3**: Analyze, evaluate and choose appropriate abstract data types and algorithms to solve particular problems; **LO4**: Design and implement C++ programs that apply abstract data types.	**PO1:** Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems. **PO2:** Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose. **PO3:** Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose. **PO4:** Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively. **PO5:** Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions. **PO6:** Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually. **PO7:** Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions. **PO8:** Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself. **PO9:** Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice. **PO10:** Knowledge about business life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development. **PO11:** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.