HASAN KALYONCU UNIVERSITY
Faculty of Engineering
Course Description Form

COURSE: Analysis of Algorithm				
CODE: CENG301	**SEMESTER:** FALL			
LANGUAGE: ENGLISH	**TYPE:** COMPULSORY			
PRE-REQUISITES: CENG214	**THEORY**	**PRACTICAL**	**CREDIT**	**ECTS**
WEEKLY HOURS:	**3**	**2**	**4**	**5**

CONTENT OF THE COURSE:
Definition and properties of Algorithms. Design, analysis, and representation of Algorithms. Models of computation. Mathematical Foundations: Growth of functions, asymptotic notations. Study of recursive algorithms and associated recurrence relations (substitution method, iteration method, recursion trees, master method). Design paradigms for algorithms: Brute-Force (Exhaustive Search), Divide-and-Conquer (Merge Sort, Binary Search Tree). Dynamic Programming (Matrix-Chain multiplication, LCS-length, 01-Knapsack Problem, etc.). Greedy algorithms (Fractional Knapsack Problem).

OBJECTIVE OF THE COURSE:
Upon successful completion of the course, students are expected to have the following competencies:
LO1: To become proficient in solving computer engineering and science problems using fundamental algorithm design techniques (e.g., divide and conquer, greedy algorithms, dynamic programming).
LO2: To gain familiarity with the main theoretical tools used in the analysis of algorithms (e.g., recurrences) .
LO3: To study and analyze different algorithms for many of the most common types of "standard" algorithmic problems (e.g., sorting, searching).
LO4: To introduce students to some of the prominent subfields of algorithmic study in which they may wish to pursue further study.
LO5: To use algorithm design techniques in state-of-the-art problems.

WEEKLY SCHEDULE	
Week	**Topics**
1	Definition and properties of Algorithms. Design, analysis, and representation of Algorithms.
2	Data abstraction. Pseudo code conventions. Models of computation.
3	Mathematical Foundations: Growth of functions, asymptotic notations.
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5	Study of recursive algorithms and associated recurrence relations
6	Substitution method, iteration method, recursion trees.
7	Master method
8	Midterm exam
9	Brute-Force (Exhaustive Search), Divide-and-Conquer.
10	Divide-and-Conquer (Merge Sort, Binary Search Tree).

11	Introduction to Dynamic Programming (LCS-length, Combination).
12	Dynamic programming (matrix-chain multiplication).
13	Dynamic programming (0-1 knapsack problem).
14	Greedy algorithms (Fractional Knapsack Problem.

TEXTBOOK: Introduction to ALGORITHMS, 3rd edition, MIT Press, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest.
REFERENCE BOOKS: Algorithms Unlocked, MIT Press, byThomas H Cormen.

EVALUATION SYSTEM:		
IN-TERM STUDIES	**QUANTITY**	**PERCENTAGE (%)**
Midterm Exam	1	30
Homework	2	10
Laboratory works	13	5
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	40
Engineering	15
Engineering Design	35
Social Sciences	10

TABLE OF ECTS / WORKLOAD:			
Activities	**QUANTITY**	**Duration (Hour)**	**Total Workload**
Course Duration	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	14	3	42
Laboratory works	13	2	26
Mid-term	1	2	2
Final examination	1	2	2
Homework	4	5	20
Quiz	2	3	6
Total Work Load			**137**
Total Work Load / 30			**4,57**
ECTS Credit of the Course			**5**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
LO1	3	3	3	3	0	1	0	0	0	0	0
LO2	3	0	0	0	0	1	0	0	0	0	0
LO3	3	0	0	0	0	1	0	0	0	0	0
LO4	0	0	0	2	0	1	0	0	0	0	0
LO5	0	3	3	3	0	1	0	0	0	0	0
	PO: Program Outcomes | LO: Learning Outcomes Values: 0: None | 1: Low | 2: Medium | 3: High										

INSTRUCTOR(S):	Asst. Prof. Dr. Saed ALQARALEH
FORM PREPARATION DATE:	22/5/2019

LEARNING OUTCOMES OF THE COURSE:	**PROGRAM OUTCOMES:**
LEARNING OUTCOMES OF THE COURSE: **LO1:** To become proficient in solving computer engineering and science problems using fundamental algorithm design techniques (e.g., divide and conquer, greedy algorithms, dynamic programming). **LO2:** to gain familiarity with the main theoretical tools used in the analysis of algorithms (e.g., recurrences). **LO3:** to study and analyze different algorithms for many of the most common types of "standard" algorithmic problems (e.g., sorting, searching). **LO4:** to introduce students to some of the prominent subfields of algorithmic study in which they may wish to pursue further study. **LO5:** To use data structures concepts in state-of-the-art problems.	**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.