University/Academy:	Arab Academy for Science, Technology & Maritime Transport
Faculty/Institute:	College of Engineering & Technology
Program:	B.Sc. Computer Engineering

Form no. (12): **Course Specification**

1- Course Data

Course Code: **CC412**	Course Title: **Computing Algorithms**	Academic Year/Level: **4**th year / **7**th semester
Specialization: **Computer Engineering**	No. of Instructional Units	Lecture	Practical
	3	**2**	**2**

2- Course Aim

To teach students the principles and techniques of designing and analyzing efficient computer algorithms

3- Intended Learning Outcomes

a- Knowledge and Understanding	**Through knowledge and understanding, students will be able to:**
	a1. Concepts and theories of mathematics and sciences, appropriate to the computer engineering.
	• List:
	  • Essential facts, concepts, principles and theories relevant to comp. eng.
	  • Engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems and reliability analysis.
	a3. Methodologies of solving engineering problems, data collection and interpretation.
	• Define
	  • Relevant mathematical methods., physical laws and the principles of electronic eng. science as applied to comp. eng. systems.
	  • Related research methods and approaches to create more advanced products.
	a6. Related research and current advances in the field of computer software and hardware and contemporary engineering topics.
	• Demonstrate:
	  • Quality assessment of computer systems.
	  • Related research methods and approaches to create more advanced products.
	  • Principles of design specific to computer engineering;

b- Intellectual Skills	**Through intellectual skills, students will be able to:** b1. Select/Apply appropriate mathematical and computer-based methods for modeling and analyzing problems and select appropriate solutions for engineering problems based on analytical thinking. • Select and apply appropriate mathematical tools, computing methods, design techniques and tools in computer engineering disciplines, for modeling and analyzing computer systems b2. Think in a creative and innovative way in problem solving and design using the latest technologies and solve engineering problems, often on the basis of limited and possibly contradicting information while identifying symptoms in problematic situations. • Demonstrate a high level of competence in identifying, defining and solving computer engineering problems

	• Maintain a sound theoretical approach in dealing with new and advancing technology
	• Select and apply appropriate IT tools to a variety of computer engineering problems
	b4. Assess and evaluate the characteristics and performance of components, systems and processes and investigate their failure.
	• Evaluate different techniques and strategies for solving computer engineering problems
c- Professional Skills	**Through professional and practical skills, students will be able to:**
	c3. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment, wide range of analytical tools, techniques, and software packages pertaining to the computer engineering to design experiments, collect, analyze and interpret results and develop required computer programs.
	• Use laboratory and field equipment competently and safely
	• Observe, record and analyze data in laboratory as well as in the field
	c8. Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development.
	• Use appropriate specialized computer software, computational tools and packages
	• Write computer programs
d- General Skills	**Through general and transferable skills, students will be able to:**
	d2. Work in stressful environment and within constraints, communicate effectively, lead and motivate individuals and effectively manage tasks, time, and resources.
	• Apply knowledge of computing, mathematics, physics and logical skills appropriate to the computer engineering discipline
	• Analyze a problem, and identify and define the computing requirements appropriate to its solution
	• Design, implement and evaluate a computer-based system, process, component, or program to meet desired needs
	• Analyze operations, realize requirements and constraints of projects and, consequently, achieve an appropriate cost effective design
	d3. Demonstrate efficient IT capabilities.
	• Use current advanced techniques, skills, and tools necessary for computing practices
	• Perform troubleshooting in computer systems
	• Use general computer and software tools professionally
	• Analyze the local and global impact of computing on individuals, organizations and society

4- Course Content

Week No.1	Introduction to the design and analysis of algorithms.
Week No.2	Measuring the asymptotic growth of functions. Lower and upper bounds.
Week No.3	The basic structures of computing: sets, relations, functions, graphs and trees.
Week No.4	The Greedy method
Week No.5	Divide and conquer I
Week No.6	Divide and conquer II
Week No.7	7th Week Exam + Dynamic Programming
Week No.8	Dynamic programming.
Week No.9	Graph algorithms.
Week No.10	Minimum spanning trees. Single-source shortest paths.
Week No.11	Computational geometry problems
Week No.12	12th Week Exam + Backtracking algorithms
Week No.13	Backtracking algorithms
Week No.14	Parallel programming I
Week No.15	Parallel programming II
Week No.16	Presentation of projects and Final Exam.

5- Teaching and Learning Methods

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

6-Teaching and Learning Methods for Students with Special Needs

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

The academic advisors of each student, as well as dedicated department TAs monitor the students' progress and solve any problem he/she may encounter.

7- Student Assessment

a-Procedures used	1-Written Examinations to assess The Intended Learning Outcomes. 2-Class Activities (Reports, Discussions, ------) to assess The Intellectual Skills.
b- Schedule:	Assessment 1 7th Week Written Exam Assessment 2 12th Week Written Exam Assessment 3 Continuous Assessment 4 16th Week Final Written Exam
c- Weighing of Assessment	7th Week Examination 30 % 12th Week Examination 20 % Final-term Examination 40 % Oral Examination 00 % Practical Examination 00 % Semester Work 10 % Total 100%

8- List of References:

a- Course Notes	
b- Required Books (Textbooks)	• Steven S. Skiena , Introduction to Algorithms, MIT press, McGraw, London, England. 2001.
c- Recommended Books	• Manber, U. Introduction to Algorithms. A Creative Approach. Reading, Mass., Addison – Wesley, 1989 • Akl, S.G. The Design and Analysis of Parallel Algorithms. Englewood Cliffs, N.J., Prentice Hall, 1989. • Preparata, F.P.; Shamos, M.I. Computational Geometry. An Introduction. Berlin, Springer, 1985. • Horowitz, E. and Sahni, S. Fundamentals of Computer Algorithms, Computer Science Press, Inc.1978
d- Periodicals, Web Sites, etc.	

Course Instructor:
Dr. Ahmed Abouelfarag

Program Manager:
Prof. Dr. Mohamad AbouEl-Nasr

Dean of College of Engineering and Technology of AASTMT

Name: **Prof. Moustafa Hussein Aly**

Signature:

Executive Manager of Quality Assurance Center of AASTMT

Name: **Prof. Aziz Ezzat**

Signature:

Dean of College of Engineering and Technology of AASTMT

Name: **Prof. Moustafa Hussein Aly**