جامعة أم القرى

UMM AL-QURA UNIVERSITY

Computer Engineering and Networks Program Guide

Introduction

This guide aims to provide the reader with all information regarding the new Computer and Networks Engineering (CEN) program initiated at Umm Al-Qura University (UQU) at the start of the fall semester of the 1444 academic year. The CEN program was part of the curriculum transformation project that took place at Umm Al-Qura University during the 1443 academic year which aimed to review and improve upon the existing curricula at the university.

The CEN program obtains it's roots from the original Computer Engineering (CE) program under the College of Computer and Information Systems. With the program transformation project and hierarchical administrative changes at UQU, some modifications were made to the original CE program to provide graduates of the program with a more extensive experience in computer networks.

Computer and Networks Engineering is now part of the College of Computing offered by the Computer and Networks Engineering Department at Umm Al-Qura University and through this guide the reader will be able to get a better understanding of this new program. The guide is organized as follows: first, we provide the vision and mission of the CEN program. Second, the reader is presented with the CEN course plan. Third, short summaries of each course are listed. Finally, the expected employment opportunities for CEN graduates are listed.

CEN Program Mission, Goals, and Learning Outcomes

The purpose of establishing the computer and networks engineering program is to enable graduates to acquire the skills needed to be competitive in the job market and to prepare them for their professional careers in computer and network engineering. The program focuses on providing students with skills on a range of computer and network engineering topics, such as microcomputer and embedded systems, sensor networks, wireless communications, and Internet of Things.

Computers are the core element of almost all industries today. Examples of core industries that rely on the technology of computing include but are not limited to the modern banking system, universities, hospitals, transportation, entertainment, manufacturing, and defense. In addition, most of these industries and institutions rely on computer and network engineers to design, build, and maintain their computer and communication networks.

The computer and network engineering program blends together computer science and electrical and networks engineering disciplines to maintain and advance digital solutions and technologies. Program graduates will use their extensive knowledge and skills to find better solutions to construct, design, and maintain hardware and software components of controlled devices, communication, electronic and electric systems, and computing.

Program Mission

The stated mission of the CEN program is to educate students to be computer and networks engineers who are competent and conscientious, and who have the ability to become intellectual professionals in industry, government, and academia. Fostering an academic environment ideal for having applied and innovative research, and for providing professional services to the Saudi community.

This program mission aligns with the mission of Umm Al-Qura University in relation to "local and global community service", "leadership in scientific research" and "leadership in education". Alignment with the university mission is achieved through the program goals which are described next.

Program Goals

The stated goals of the CEN program are as follows:

- Practice as computer engineers in problem-solving, designing, implementing, and maintaining computing systems.
- Practice as network engineers in network planning, designing, implementing, securing, and troubleshooting.
- Utilize their professional education/ knowledge for the benefits of society or/and the profession.
- Keep their professional knowledge updated through further education or exploring available resources and through engineering educational seminars or workshops.
- Assume leadership positions in industry, academia, and public service, and/or contribute positively to their growth and sustainability.

Program Learning Outcomes

There exist 7 program learning outcomes for the CEN program. These are divided amongst three core areas as per outlined by the National Center for Academic Accreditation and Evaluation (NCAAA). These core areas are Knowledge and Understanding (K), Skills (S), and Values (V). The first core area (K) contains one learning outcome, the second core area (S) contains 4 learning outcomes, and the last core area (V) contains 2 learning outcomes. Table 1 shows the seven learning outcomes of the program.

Knowledge and Understanding	
K1	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Skills	
S1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
S2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
S3	An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.
S4	An ability to communicate effectively with a range of audiences.
Values	
V1	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
V2	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Table 1: Program learning outcomes for CEN program.

Course Plan

The Computer and Networks Engineering course plan is a 5-year plan consisting of a total of 245 credit hours based on a quarter system. Each quarter is referred to as a level and does not exceed 18 credit hours. The minimum number of credits for a quarter is 15 hours. The program consists of a total of 15 levels.

As outlined in Table 2, which shows the curriculum structure of the CEN program, Institution requirements make up about 15% of the total credit hours. The specific program requirements make up 60% of the total credit hours.

Program Structure	Required/Elective	Number of Courses	Credit Hours	Percentage
Institution Requirements	Required	12	30	12.20%
	Elective	4	8	3.25%
College Requirements	Required	9	32	13.01%
Program Requirements	Required	40	148	60.16%
	Elective	3	12	4.88%
Capstone Course/Project	Required	2	8	3.25%
Field Experience/Internship	Required	1	8	3.25%
Others	-	0	0	0.00%
Total		71	246	100.00%

Table 2: Curriculum structure for CEN program.

Common First Year

As shown in Table 2, the college requirements make up 13% of the total credit hours of the program. These courses are part of the common first year offered to all students at the College of Computing. In fact, students in the first year have yet to select their course of study. Admission to the CEN program is based on passing all first-year courses with a cumulative GPA set by the Admissions Office – Office of the Registrar at Umm Al-Qura University.

The first-year courses (Table 3) cover general requirements such as English and Islamic Studies, and Work Environment. They also take mathematics and science courses such as Linear Algebra, Discrete Structures, Introductory Calculus, General Physics, and Statistics and Probability. Furthermore, students are introduced to computer programming through 3 courses: Computational Thinking and Problem Solving, Computer Programming 1, and Computer Programming 2. The last quarter of the year, students are offered a course titled Topics in Computing that introduces the students to the programs offered by the college.

First Quarter (Level 1)		
Code	Course Name	Credits
ELCE1201	English Language 1	4
QR1101	Holy Quran 1	2
SE1101	Computational Thinking & Problem Solving	3
MTH1105	Calculus 1	4
CS1101	Discrete Structures 1	4
Second Quarter (Level 2)		
ELCE1202	English Language 2	4
ICC1201	Islamic Culture 1	2
CS1211	Computer Programming 1	3
PHY1110	General Physics	4
MTH1211	Linear Algebra 1	4
Third Quarter (Level 3)		
ELCE1203	English Language 3	4
BA1901	Career Preparation Skills	2
CS1312	Computer Programming 2	3
DS1302	Topics in Computing	3
MTH1501	Elementary of Statistics and Probability	4

Table 3: Common first year for College of Computing students.

CEN Program Courses

The program courses offered by the CEN course plan revolve around two main areas: computer engineering and networks. Figure 1 shows the outline of the CEN program course plan. The circled numbers on the right of the figure indicate the level or quarter. The blue numbers to the left of the figure indicate the total number of credits to be registered for that quarter.

The course blocks provide the course number, course name, and number of credits. All yellow blocks refer to courses offered by the CEN department. The purple blocks indicate courses offered by the Computer Science and AI department. Orange blocks are general sciences courses, and turquoise-colored blocks are institutional requirements for Umm Al-Qura University. The light green blocks refer to electives and those include three program elective courses offered by the CEN department specified in the last three levels (13, 14, and 15). Furthermore, the arrows show the flow of prerequisites in the CEN course plan.
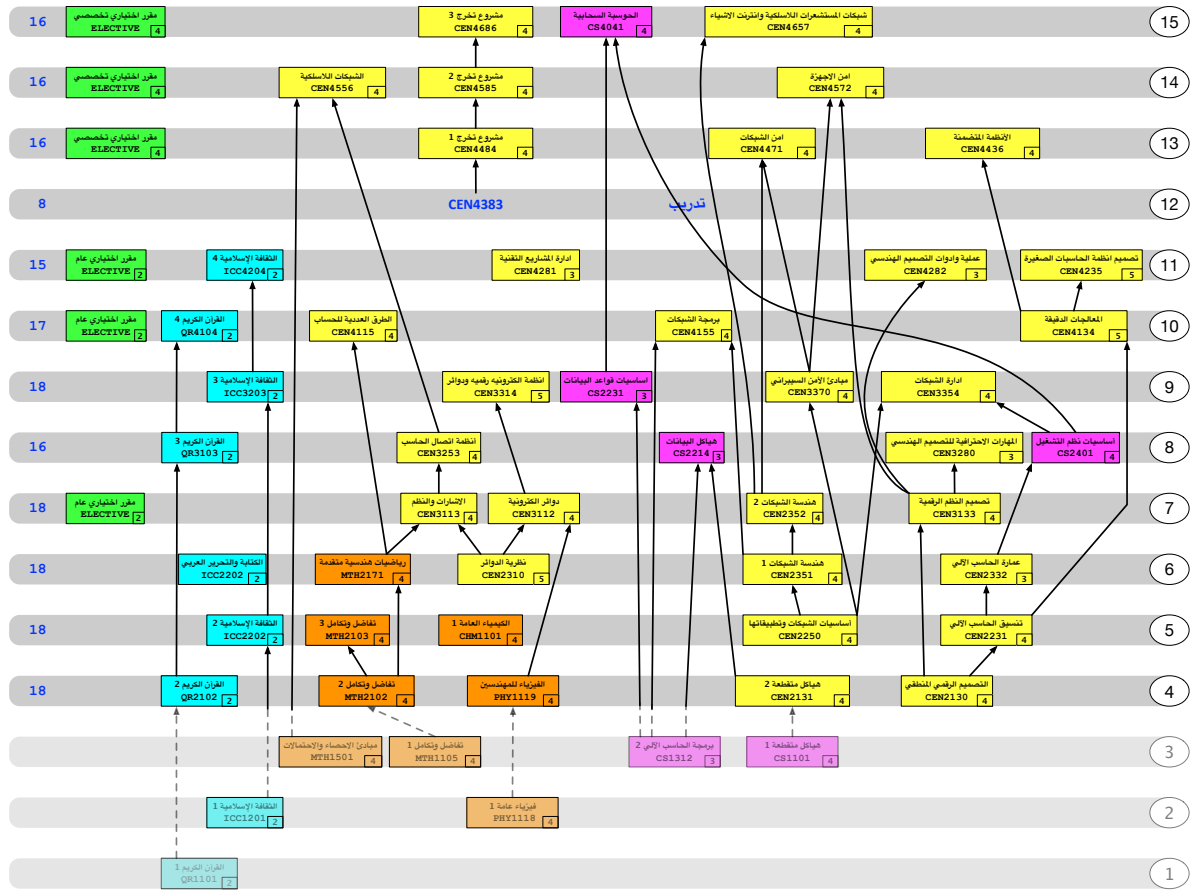
Figure 1: CEN course plan with prerequisites.

CEN Program Electives

The CEN program provides 14 elective courses that students may choose to take in their final year of the program. Two of the courses are offered by the Computer Science and AI department. This list of courses is provided in

Course Number	Course Name	Cr.	Prerequisites
CEN4903	Digital Signal Processing	4	Signals and Systems (CEN3113)
CEN4904	Engineering Optimization	4	Discrete Structures 2 (CEN2131)
AI3285	Introduction to Computer Vision	4	Image Processing
CEN4906	Digital Image Processing	4	Computer Programming 2 (CS1312)
AI4065	Introduction to Neural Networks	4	
CEN4908	Introduction to Robotic Systems	4	Embedded Systems (CEN4436)
CEN4909	Principles of VLSI Design	4	Electronic Circuits (CEN3112)
CEN4901	Special Topics in Computer Networks	4	
CEN4910	Mobile Computing	4	Computer Communication Systems (CEN3253)
CEN4902	Special Topics in Computer Engineering	4	
CEN4911	Advanced Computer Architecture	4	Computer Architecture (CEN2332)
CEN4912	Advanced Topics in Computer Networks	4	Network Programming (CEN4155)
CEN4913	Enterprise and Cloud Networks	4	Network Engineering 2 (CEN3152)
CEN4914	Network Access Systems	4	Computer Communication Systems (CEN3253)

Table 4: CEN program elective courses.

Employment Opportunities for CEN Graduates

Many opportunities exist for Computer and Networks Engineering graduates. Some of the job titles are outlined below:

- Embedded engineer
- Network engineer
- Hardware engineer
- Digital engineer
- Analog engineer
- Layout engineer
- RF engineer
- Computer engineer
- Information security engineer
- Head of information technology
- Head of technical support

Contact Us

The computer and networks engineering department can be reached at the contact details given below. Please feel free to contact us at your convenience if you have questions.

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More Information

More information related to admissions, registration, and general university and student regulations can be found at:

Deanship of Admission and Registration:
 https://uqu.edu.sa/dadregis

Deanship of Student Affairs:
 https://uqu.edu.sa/studaff

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