جامعة أم القرى
UMM AL-QURA UNIVERSITY

Program Guide

MSc in Computer Engineering Program

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1. Introduction

This guide has been prepared for the Master of Science in Computer Engineering (MSc CE) program offered by the Department of Computer and Network Engineering (CEN) in the College of Computing at Umm Al-Qura University (UQU), Makkah, Saudi Arabia. The aim of this guide is to provide the reader with all the information about the MSc CE Program. The guide is organized as follows: first, we provide the vision and mission of the MSc CE program. Second, the reader is presented with the MSc CE course plan. Finally, the expected employment opportunities for MSc CE graduates are listed.

2. Program Identification

Item	Details
Program Name	Master of Science in Computer Engineering
Department	Computer and Network Engineering (CEN)
College	College of Computing
University	Umm Al-Qura University (UQU), Makkah, Saudi Arabia
NQF Level	7 (Master's Degree)
Total Credit Hours	42
Study System	Semester-based
Mode of Study	Full-time

The purpose of establishing the MSc CE 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 engineering. The program focuses on providing students with skills in a range of computer engineering topics, such as intelligent systems, microcomputer and embedded systems, computer 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 engineers to design, build, and maintain their computer and communication networks.

The MSc CE program blends together computer science and electrical and network 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.

3. Employment Opportunities

Some relevant occupational/professional sectors are Telecommunication, Internet of Things (IoT), Embedded systems, and Computer systems. Many opportunities exist for an MSc. CE graduates. Some of the job titles are outlined below:

- Computer Engineer
- Data Systems Engineer
- Cybersecurity Analyst
- IT Consultant
- AI/ML Engineer
- Cloud Solutions Architect
- Embedded Systems Engineer
- Computer Hardware Engineer/Architect/Tester
- Computer Systems Analyst/Project Manager
- Network Engineer/Architect/Tester
- Computer Systems Administrator/Architect
- Computer Systems and Network Security Administrator/Architect

4. Program Mission

To cultivate competent and conscientious computer engineering graduates capable of intellectual leadership in industry, government, and academia. It also aims to foster an academic environment conducive to applied and innovative research and to provide valuable professional services to the Saudi community.

This program's 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.

5. Program Goals

The MSc CE program aims to produce graduates who will:

1. Practice as computer engineers in problem-solving, designing, and implementing computing systems.
2. Utilize their professional education/knowledge for the benefit of society and/or the profession.
3. Keep their professional knowledge up to date through further education, exploring available resources, and attending engineering educational seminars or workshops.
4. Assume leadership positions in industry, academia, and public service, and/or contribute positively to their growth and sustainability.

6. NQF Domains and Program Learning Outcomes

The MSc CE program learning outcomes (PLOs) are defined across the three domains of the Saudi National Qualifications Framework (NQF). Each PLO is mapped to specific courses in the curriculum using the PLO mapping matrix, which tracks the level of engagement: Introduced (I), Practiced (P), or Mastered (M).

6.1 NQF Domains

Domain	Code	Description
Knowledge and Understanding	K	Broad, in-depth, integrated knowledge of theories, principles, concepts, processes, and techniques
Skills	S	Application of theories, problem-solving, critical thinking, communication, and use of digital tools
Values, Autonomy and Responsibility	V	Commitment to professional and ethical standards; planning for self-development

6.2 Program Learning Outcomes

PLO	Domain	Description
K1	Knowledge	Identify and formulate complex computer engineering problems
K2	Knowledge	Explain fundamental concepts and recent advances of computer engineering at a deep level
S1	Skills	Design and implement creative and novel solutions and models for current issues in various complex contexts related to computer engineering by applying critical thinking and principles of engineering, science, and mathematics.
S2	Skills	Acquire and apply new specialized knowledge in the field of computer engineering as needed, using appropriate learning strategies
S3	Skills	Communicate effectively with a range of audiences to transfer computer engineering knowledge and skills
S4	Skills	Conduct inquiries, investigations and research for complex computer engineering issues and problems
V1	Values	Demonstrate commitment to ethical and professional responsibilities in scientific research and engineering situations to make informed judgments while considering global, economic, environmental, and societal impacts
V2	Values	Function effectively as an individual and in a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6.3 PLO Mapping Matrix

The complete PLO mapping matrix maps all the courses in the MSc CE program to the 8 PLOs using the I-P-M framework. The full matrix is maintained in the program specifications document (TPG-151). Each course is mapped to indicate whether it introduces (I), Provides Practice in (P), or enables Mastery of (M) each PLO. This document is available on the program's website.

6.4 Teaching and Learning Strategies

The MSc CE program employs the following teaching and learning strategies:

- Classroom lectures and seminar-style discussions
- Reading assignments and research article reviews
- Research presentations by students
- Laboratory work and hands-on projects
- Capstone research project under faculty supervision
- Collaborative group work and peer review

6.5 Assessment Methods

Assessment methods include both direct and indirect measures:

Direct assessment:

- Homework assignments and problem sets
- Midterm and final examinations
- Course projects and technical reports
- Oral presentations and research defenses
- Capstone research project evaluation

Indirect assessment:

- Student course evaluation surveys
- Graduate exit surveys
- Employer satisfaction surveys
- Alumni surveys

7. Program Tracks

The MSc CE program offers four specialized tracks:

Track	Code	Description
General Track	T1	Broad coverage across CE disciplines with flexible electives
Intelligent Systems	T2	Focus on AI, machine learning, and intelligent computing
Wireless Comm. and Networks	T3	Focus on wireless systems, protocols, and communication technologies
Embedded Systems and IoT	T4	Focus on embedded design, IoT architectures, and HW-SW integration

8. Curriculum Structure

The MSc CE course plan is a 2-year plan consisting of a total of 42 credit hours. The program consists of a total of 4 levels. The following tables show the curriculum structure of each of the four tracks:
General Track (T1) credit hour breakdown:

Component	Courses	Credit Hours	Percentage
Required Courses	8	24	57%
Elective Courses	4	12	29%
Graduation Project	1	6	14%
Total	13	42	100%

Specialized Tracks (T2, T3, T4) credit hour breakdown:

Component	Courses	Credit Hours	Percentage
Required Courses	11	33	79%
Elective Courses	1	3	7%
Graduation Project	1	6	14%
Total	13	42	100%

9. Program Plan and Courses

General Track (T1):

Level	Course Code	Course Title	Required or Elective	Credit Hours
Level 1	CE6000	Computer Architecture	Required	3
	CE6024	Advanced Computer Networks	Required	3
	CE6003	Advanced Engineering Mathematics	Required	3
	CE6007	Research Methods for Engineers	Required	3
Level 2	CE6004	Embedded Systems	Required	3
	CE6028	Distributed Systems	Required	3
	CE6029	Networks Security Engineering	Required	3
	CE6030	Seminars in Computer Engineering	Required	3
Level 3	CE6XXX	Elective Course 1	Elective	3
	CE6XXX	Elective Course 2	Elective	3
	CE6097	Master's Capstone Research Project	Required	6
Level 4	CE6XXX	Elective Course 3	Elective	3
	CE6XXX	Elective Course 4	Elective	3
	CE6097	Master's Capstone Research Project (continuing from last level)	Required	6

Intelligent Systems Track (T2):

Level	Course Code	Course Title	Required or Elective	Credit Hours
Level 1	CE6000	Computer Architecture	Required	3
	CE6024	Advanced Computer Networks	Required	3
	CE6003	Advanced Engineering Mathematics	Required	3
	CE6007	Research Methods for Engineers	Required	3
Level 2	CE6004	Embedded Systems	Required	3
	CE6028	Distributed Systems	Required	3
	CE6029	Networks Security Engineering	Required	3
	CE6030	Seminars in Computer Engineering	Required	3
Level 3	CE6100	Edge and Cloud Computing	Required	3
	CE6101	Machine Learning Engineering	Required	3
	CE6097	Master's Capstone Research Project	Required	6
Level 4	CE6102	Tiny Machine Learning (TinyML)	Required	3
	CE6XXX	Elective Course 1	Elective	3
	CE6097	Master's Capstone Research Project (continuing from last level)	Required	6

Wireless Communications and Networks Track (T3):

Level	Course Code	Course Title	Required or Elective	Credit Hours
Level 1	CE6000	Computer Architecture	Required	3
	CE6024	Advanced Computer Networks	Required	3
	CE6003	Advanced Engineering Mathematics	Required	3
	CE6007	Research Methods for Engineers	Required	3
Level 2	CE6004	Embedded Systems	Required	3
	CE6028	Distributed Systems	Required	3
	CE6029	Networks Security Engineering	Required	3
	CE6030	Seminars in Computer Engineering	Required	3
Level 3	CE6011	Digital Communications	Required	3
	CE6201	Wireless Sensor Networks	Required	3
	CE6097	Master's Capstone Research Project	Required	6
Level 4	CE6202	Mobile Networks	Required	3
	CE6XXX	Elective Course 1	Elective	3
	CE6097	Master's Capstone Research Project (continuing from last level)	Required	6

Embedded Systems and IoT Track (T4):

Level	Course Code	Course Title	Required or Elective	Credit Hours
Level 1	CE6000	Computer Architecture	Required	3
	CE6024	Advanced Computer Networks	Required	3
	CE6003	Advanced Engineering Mathematics	Required	3
	CE6007	Research Methods for Engineers	Required	3
Level 2	CE6004	Embedded Systems	Required	3
	CE6028	Distributed Systems	Required	3
	CE6029	Networks Security Engineering	Required	3
	CE6030	Seminars in Computer Engineering	Required	3
Level 3	CE6100	Edge and Cloud Computing	Required	3
	CE6300	System Level Design for Embedded Systems	Required	3
	CE6097	Master's Capstone Research Project	Required	6
Level 4	CE6301	Design Principles of IoT Systems	Required	3
	CE6XXX	Elective Course 1	Elective	3
	CE6097	Master's Capstone Research Project (continuing from last level)	Required	6

Elective Courses of the General Track (T1), the Intelligent Systems Track (T2), the Wireless Communications and Networks Track (T3), and the Embedded Systems and IoT Track (T4):

The check mark indicates that the course is allowed to be taken as elective course in the track

Course Code	Course Title	Credit Hours	T1	T2	T3	T4
CE6002	Applied Cryptography	3	✓	✓	✓	✓
CE6032	Reconfigurable Hardware Accelerators	3	✓	✓	✓	✓
CE6015	Hardware Security	3	✓	✓	✓	✓
CE6021	Image Processing and Computer Vision	3	✓	✓	✓	✓
CE6035	Generative Models and Systems	3	✓	✓	✓	✓
CE6036	Computer Systems for Crowd Management	3	✓	✓	✓	✓
CE6037	Special Topics in Intelligent Systems	3	✓	✓	✓	✓
CE6038	Special Topics in Wireless Communication and Networking	3	✓	✓	✓	✓
CE6039	Special Topics in Embedded Systems and IoT	3	✓	✓	✓	✓
CE6100	Edge and Cloud Computing	3	✓		✓	
CE6101	Machine Learning Engineering	3	✓		✓	✓
CE6102	Tiny Machine Learning (TinyML)	3	✓		✓	✓
CE6011	Digital Communications	3	✓	✓		✓
CE6201	Wireless Sensor Networks	3	✓	✓		✓
CE6202	Mobile Networks	3	✓	✓		✓
CE6300	System Level Design for Embedded Systems	3	✓	✓	✓	
CE6301	Design Principles of IoT Systems	3	✓	✓	✓	

All course specifications are available in the following link:

https://uqu.edu.sa/ccomp_cen/App/FILES/173981

Summarization of all tracks and their required and elective courses:

	Master of Science in Computer Engineering (42 Credit Hours)			
Term 1	CE6000 - Computer Architecture (3)			
	CE6024 - Advanced Computer Networks (3)			
	CE6003 - Advanced Engineering Mathematics (3)			
	CE6007 - Research Methods for Engineers (3)			
Term 2	CE6004 - Embedded Systems (3)			
	CE6028 - Distributed Systems (3)			
	CE6029 - Networks Security Engineering (3)			
	CE6030 - Seminars in Computer Engineering (3)			
By the end of Term 2, a Track selection request must be submitted to the Deanship of Postgraduate Studies and Research				
Track	**General**	**Intelligent Systems**	**Embedded Systems and IoT**	**Wireless Communication and Networks**
Term 3	CEXXXX - Elective Course (3)	CE6100 - Edge and Cloud Computing (3)		CE6011 - Digital Communications (3)
	CEXXXX - Elective Course (3)	CE6101 - Machine Learning Engineering (3)	CE6300 - System Level Design for Embedded Systems (3)	CE6201 - Wireless Sensor Networks (3)
	CE6097 - Master's Capstone Research Project (6)			
Term 4	CEXXXX - Elective Course (3)	CE6102 - Tiny Machine Learning (TinyML) (3)	CE6301 - Design Principles of IoT Systems (3)	CE6202 - Mobile Networks (3)
	CEXXXX - Elective Course (3)			
	[continue] CE6097 - Master's Capstone Research Project (6)			

Any CEXXXX - Elective Course: can be one of the following if not already taken
Elective Courses
CE6002 - Applied Cryptography (3)
CE6032 - Reconfigurable Hardware Accelerators (3)
CE6015 - Hardware Security (3)
CE6021 - Image Processing and Computer Vision (3)
CE6035 - Generative Models and Systems (3)
CE6036 - Computer Systems for Crowd Management (3)
CE6037 - Special Topics in Intelligent Systems (3)
CE6038 - Special Topics in Wireless Communication and Networking (3)
CE6039 - Special Topics in Embedded Systems and IoT (3)
CE6100 - Edge and Cloud Computing (3)
CE6101 - Machine Learning Engineering (3)
CE6102 - Tiny Machine Learning (TinyML) (3)
CE6011 - Digital Communications (3)
CE6201 - Wireless Sensor Networks (3)
CE6202 - Mobile Networks (3)
CE6300 - System Level Design for Embedded Systems (3)
CE6301 - Design Principles of IoT Systems (3)

10. General University Admission Requirements

The general admission requirements to Umm Al-Qura University can be found on the website of the Deanship of Postgraduate Studies and Research at the following link: https://uqu.edu.sa/gs

11. Contact Us

The Computer and Network Engineering Department can be reached at the contact details given below. Please feel free to contact us at your convenience if you have questions.

Email address: ccomp_cen@uqu.edu.sa
Tel: +966 12 527 0000 ext. 6710 or 6711
Department website: https://uqu.edu.sa/ccomp_cen

12. Additional Information

More information related to admissions, registration, and general university and student regulations can be found in the following weblinks:

UQU Deanships	Web Link
College of Computing	https://uqu.edu.sa/ccomp
Department of Computer and Network Engineering	https://uqu.edu.sa/ccomp_cen
Deanship of Postgraduate Studies and Research	https://uqu.edu.sa/gs
Deanship of Admissions and Registration	https://uqu.edu.sa/dar
Deanship of Student Affairs	https://uqu.edu.sa/studaff
Deanship of Library Affairs	https://uqu.edu.sa/lib
Deanship of Information Technology	https://uqu.edu.sa/it

Student Services (can also be reached through Deanship of Student Affairs website)	Web Link
Student Guidance and Counseling Center	https://uqu.edu.sa/studaff/119519
Ghali Center for Students with Disabilities	https://uqu.edu.sa/studaff/119197
Student Rights and Discipline Department	https://uqu.edu.sa/studaff/119029
Student Compensation Department	https://uqu.edu.sa/studaff/121647
Student Housing Department	https://uqu.edu.sa/studaff/121703
Student Transportation Department	https://uqu.edu.sa/studaff/119344

Prepared by the Graduate Studies Committee (GSC):

Role	Name	M
Chairman of the Committee	Dr. Anas Hazim Daghistani ahdaghistani@uqu.edu.sa	1
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