

**Sana'a University**  
**Faculty of Engineering**  
**Department Electrical Engineering**



# **Master of Science in Computer Engineering and Control**

## **Program Specifications**

**June - 2021**

Faculty of Engineering, Sana'a University

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University of Sana'a  
 Faculty of Engineering  
 Department: Electrical Engineering  
 Title of the Program:  
 Master of Science in Computer Engineering & Control



## Program Specification

### 1. Program Introduction/Description

Master of science in Computer engineering and Control is an innovative engineering program, which provides advanced knowledge and skills necessary to integrate advanced concepts in Computer Engineering/Science and Intelligent Control System into the development of appropriate solutions to current research problems and sustainable developments requirements. The program study system is a mix of coursework and research with average period of three years. The graduated engineer with a specialization in computing and control is at the forefront of current research and development challenges related to industrial development, networking, medical and IT to business and markets. The master program is offered by the college of engineering at Sana'a university in at most, three academic years to fulfill the increasing demand of high-qualified graduates who are able to deal with different areas related to computer & intelligent control and to conduct researches & solve development problems creatively and efficiently. The master graduate program includes different kinds of advanced courses that covers advanced understanding related the fields of computing and intelligent control, courses for developing further skills needed to carry out and manage engineering projects management and machine/deep learning, as well as, research work through thesis work for solving current research problems and development issues.

Moreover, the master degree in computer engineering and control allows access to a PhD program in electrical engineering, computing, controls and related fields or to pursue careers, to lead projects as required and/or to join a professional society, such as IET, IEEE, etc.

Some of the Promising Jobs are: -

- 1- Advanced computer architecture, Digital Systems and Computer-aided Design.
- 2- Advanced Database Systems, Software Engineering, Intelligent Controls & Machine/Deep Learning.
- 3- Advanced Networking Technologies.
- 3- Automation, Robotics and Machine Vision.
- 6- Advanced Embedded systems, Distributed Systems & IoT.

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## Program Specification

### 2. Program Identification and General Information

Program Title	Master of Science in Computer Engineering & Control
Awarding Institution	Sana'a University
Department	Department of Electrical Engineering
Other Departments with major Teaching Contributions	None
Language of study	English Language.
Date of Specification Preparation/Revision	Apr. – Jun. 2021
Mode of Study	Regular [Minimum attendance 75%] (Full time)
Study System	Courses & Thesis
Main Location of Study	Faculty of Engineering/Sana'a University
Mode of Delivery	Semesters (Full-time)
Study Duration	Minimum: 2 Academic years (Two terms each, full-time) Maximum: 4 Academic years (two terms each - full time)
Award(s) or Final Award	Master of Science (MSc.) in Computer Engineering & Control
Qualification required to join the program:	BSc. in Electrical Engineering and/or related fields like BSc. in Mechatronics Engineering, BSc. in Biomedical Engineering or BSc. in Computer Science & IT.
Minimum grade requirements to enroll in the program	Good
Other admission requirements	Detailed below
Name of the program coordinator	Assoc. Prof. Farouk Al-Fahaidy
Approval date:	----

### 3. Program Curriculum Committee:

<b>Assoc. Prof. Farouk Al-Fahaidy, Program Coordinator</b> <b>Assoc. Prof. Adel Al-Shokairi</b> <b>Assoc. Prof. Belal Al-fohaidi</b> <b>Dr. Osamah Alshebami</b> <b>Dr. Sami Al-Maqtari</b> <b>Dr. Mohammed Al-Olofi</b>	<b>Prof. Abdelraqib Asaad</b> <b>Prof. Mohamed Al-bukhaiti</b> <b>Assoc. Prof. Redhwan Albouthigi</b> <b>Dr. Mohammad Abdulla Algorafi</b> <b>Dr. Mohammed Alzareii</b> <b>Dr. Khaled Alwosaby</b>
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### 4. Vision, Mission & Aims of the University

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### Vision of the University

Sana'a University aspires to achieve a national leading role in teaching, learning, scientific research and community service; and to be among the best regional universities and the foremost house of expertise and think tank in Yemen.

### Mission of the University

To contribute to the sustainable development efforts by providing an accredited higher education environment and excellent research services within a fruitful national partnership based on transparency, professionalism and creativity.

### Aims of the University

The University seeks to achieve the following objectives:

- To provide specialized and in-depth academic opportunities for students in different fields of knowledge to meet the country's needs of specialties, technicians and experts, with special focus on the following:
  - To boost the level and quality of preparation and qualification tasks.
  - To create a general culture aiming at developing the elements of sound Islamic personality and the proper cognitive and scientific training.
  - To stabilize the true Islamic vision emanating from the broad horizons of Islamic knowledge and its perception of the universe, man and life.
  - To develop innovative and critical scientific thinking skills.
  - To provide students with the required knowledge and scientific and applied skills for solving problems effectively and efficiently.

## 5. Vision, Mission & Aims of the Faculty

### Vision of the Faculty

To excel in engineering education & scientific research with distinction at the local and regional levels.

### Mission of the Faculty

To provide excellent and accredited engineering education to meet the development needs and match the labor market requirements locally and regionally.

### Aims of the Faculty

1. To offer study programs in various fields of knowledge and equip students with required knowledge and scientific and know-how skills to utilize them in resolving problems effectively and efficiently.
2. To develop positive trends towards engineering science and its accelerating developments and enable students to use the techniques and methods of conducting scientific research in engineering fields.

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### 5. Vision, Mission & Aims of the Faculty

3. To develop skills of scientific, innovative and critical thinking as well as the concept of continuous self-education.
4. To strengthen scientific ties with national and international colleges, scientific bodies, and research & development centers.
5. To provide technical and specialized studies and consultations to various state bodies and institutions, both public and semi-public, and utilize them in resolving the environment and society issues to promote sustainable development.
6. To develop a spirit of co-operation, group work, effective leadership, sense of responsibility, and ethical commitment.

### 6. Mission & Aims of the Department

#### Mission of the Department

Graduate qualified Engineers in Electric Power, communication and computer engineering in accordance with programs committed to the international quality standards. The Graduating Engineers handed with enough knowledge and skills necessary to meet the requirements of development as well as local and regional labor markets. Also, they able to self-development and proceed with contemporary issues. The department contribute to community wellness and the country development through scientific research, advisory services, and training and education programs.

#### Aims of the Department

1. Graduate high qualified engineers in electrical power, communication and computer engineering able to compete at national and regional levels.
2. Update undergraduate and post graduate programs and enhance the applied research environment to contribute in country development.
3. Establish partnerships with the public and private sectors and provide engineering consultancies, continuous training, teaching and awareness programs.
4. Improve the academic staff to student ratio as per standard.
5. Fill the gap in the number of assistance staff and laboratory technicians and implement training programs to enhance their skills.
6. Commit and uphold high ethical and professional conduct in the education and practice of engineering.

### 7. Mission & Aims of the Program

#### Mission of the Program

To graduate eminent master engineer in computer engineering & control and field research through a high-qualified academic program, suitable infrastructure and high-qualified staffs, that meet the development requirements as well as local and regional labor markets.

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Aims of the Program	
1.	To provide specialized studies and encourage fundamental and applied research in different computer engineering and control disciplines.
2.	To bridge the gap between the academic educational in university and its industrial and technological environment.
3.	To deliver graduates with serious scientific and skills letting them excel in their professional life by applying ethical practices and communication skills, sharing innovative and clear ideas and pursuing further education through lifelong learning.
4.	To produce researchers in computer engineering and control disciplines who can pursue further studies and contribute to the scientific research community.
5.	To contribute effectively in adapting and responding that meet the changing needs of a knowledge-based economy and the rapid changing in the evolving computing field.

### 8. Program Standards & Benchmarks

#### Program Standards

- Rules and Regulations of the Ministry of Higher Education and Scientific Research, Yemen.
- Accreditation Board for Engineering and Technology (ABET)
- Institute for Electronics & Technology (IET)

#### Program Benchmarks

Program Title	College	University-Country
1. Master of Science in Computing- Computer Engineering	College of Engineering	Qatar University-Qatar
2. COMPUTER SCIENCE AND ENGINEERING	Faculty of Information and Communication Engineering	ANNA University- India
3. Master program of Computer Engineering	School of Engineering	ATILIM University- Turkey
4. Computer Engineering M.S.	Graduate School of Engineering & Management	Air Force Institute of Technology- USA
5. Computer Science and Engineering	Graduate School	University of Louisville- USA
6. Control Systems	Faculty of Engineering	Imperial College London- U.K.

### 9. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program

	The Similar Programs (Benchmarks)						Current Program
	1 <sup>st</sup> Program	2 <sup>nd</sup> Program	3 <sup>rd</sup> Program	4 <sup>th</sup> Program	5 <sup>th</sup> Program	6 <sup>th</sup> Program	
Program	Master of	COMPUTER	Master	Computer	Computer	Control	Master of

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### 9. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program

Title	Science in Computing-Computer Engineering	SCIENCE AND ENGINEERING	program of Computer Engineering	Engineering M.S.	Science and Engineering	Systems	Science in Computer and Control Engineering
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	Faculty of Engineering
University	Qatar University	ANNA UNIVERSITY, CHENNAI	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College, London	Sanaa University
Country	Qatar	India	Turkey	US	US	UK	Yemen
Type of Program	Courses & Thesis	Courses & Project	Courses + Thesis	Courses & Thesis	Courses & Thesis	Courses & Projects	Courses and Thesis
Study methods in the program:	Regular	Regular	Full Time	Full Time	Full Time	Full Time	Regular
Number of semesters	4	4	4	4	4	1 academic Year (12-months)	4
Total Credit Hours (without Thesis)	25	52	21-Crd. (40-ECTS)	36	24	50 (50*0.6=30)	30
No. of Compulsory Courses	7	8 Courses with 5-Labs	4	6	4	4	7
Credit Hours	19	35	9-Crd.	24 + 12	12	20 with	21

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9. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program							
for Compulsory Courses			(20-ECTS)	for Application Sequence		10-Lab	
No. of Elective Courses	2	5	4	--	2-course + 1 Technical	4	3
Credit Hours for Elective Courses	6	17	12-Crd. (20-ECTS)	--	12	20 (20*0.6=12)	9
Complementary courses to join the program and their number							6-courses listed in table on next
Credit Hours for Thesis	6	18	0-Crd. (80 ECTS)	12	6	40 (0.6*40=27)	6
Total Credit Hours for courses & Thesis	31	70	21-Crd. (120 ECTS)	48	30	90 (0.6*90=54)	36
The period for thesis completion	2-Semesters	2-Semesters	2-Semesters	2-Semesters	2-Semesters	7-months partially in parallel with courses	2-Semesters
The min. period to complete the program	2-y	4-Semesters	2-y	2-y	2-y	Ac. Year	2-y
The max. period to complete the program		12-Semesters*			Up to 6-y		Up to 3-y

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## Program Specification

### 10. Program Intended Learning Outcomes (PILOs)

#### A. Knowledge and Understanding

Upon successful completion of the Master of Science in Computer Engineering and Control Program, graduates should be able to:

A1.	Demonstrate deep understanding of computer engineering and control as well as knowledge of applied mathematics and engineering science to the field of computing and intelligent control.
A2.	Recognize and Explain the contemporary engineering technologies and issues in the specialization field of computing and control.
A3.	Explain in-depth the principles of sustainable design and development of computing products, standards and protocols and intelligent control systems.

#### B. Intellectual Skills

Upon successful completion of the Master of Science in Computer Engineering and Control Program, graduates should be able to:

B1.	Evaluate, select and apply appropriate principles, methodologies, techniques, tools and packages to the analysis, specification, development and evaluation of computing and engineering systems.
B2.	Identify, formulate, analyze and solve research and complex engineering problems.
B3.	Propose computing system, component, or process to meet desired needs within realistic constraints.

#### C. Practical and Professional Skills

Upon successful completion of the Master of Science in Computer Engineering and Control Program, graduates should be able to:

C1.	Develop, configure, upgrade, and/or write computer software/program to solve computing and control problems.
C2.	Use and apply advanced methodology and skills to the formulation and practice of computer science, engineering and control systems.
C3.	Employ acquired knowledge into a philosophical and intellectual frame that can be applied to computer engineering & control systems and process design and implementation.

#### D. Key Transferrable Skills

Upon successful completion of the Master of Science in Computer Engineering and Control Program, graduates should be able to:

D1.	Prepare complete thesis and reports, present ideas clearly and defend them
D2.	Balance professional and ethical responsibilities including contemporary issues and environmental awareness
D3.	Conduct independently and communicate research that advances and extends computing

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## Program Specification

### 10. Program Intended Learning Outcomes (PILOs)

knowledge and scholarship in relate.

### 11. Teaching Strategy to Achieve Program Learning Outcomes

ILOs	Teaching Strategy	Assessment Methods
A1	Lectures, Seminars, laboratory works, Self-Learning., independent study, active learning, computer hands-on sessions.	Experimental and field work, laboratory report, survey, Written Exam, Assignments
A2	Lectures, Seminars, laboratory works, Self-Learning., independent study, active learning, computer hands-on sessions.	Experimental and field work, laboratory report, survey, Written Exam, Assignments
A3	Lectures, Seminars, laboratory works, Self-Learning., independent study, active learning, computer hands-on sessions.	Experimental and field work, laboratory report, survey, Written Exam, Assignments
B1	Project supervision, laboratory works, Self-Learning, simulation exercises, independent study, Analysis and Problem Solving, Lectures, Brain storming Presentations, Presenting researches	Experimental and field work, laboratory report, survey, Written Exam, Assignments.
B2	Project supervision, laboratory works, Self-Learning, simulation exercises, independent study, Analysis and Problem Solving, Lectures, Brain storming Presentations, Presenting researches	Experimental and field work, laboratory report, survey, Written Exam, Assignments.
B3	Project supervision, laboratory works, Self-Learning, simulation exercises, independent study, Analysis and Problem Solving, Lectures, Brain storming, Presentations, Presenting researches	Experimental and field work, laboratory report, survey, Written Exam, Assignments.
C1	Project supervision, lectures, laboratory works, independent study, simulation exercises, Analysis and Problem Solving	Seminar report, written research proposal, thesis and publication.
C2	Project supervision, lectures, laboratory works, independent study, simulation exercises, Analysis and Problem Solving	Seminar report, written research proposal, thesis and publication.
C3	Project supervision, lectures, laboratory works, independent study, simulation exercises, Analysis and Problem Solving	Seminar report, written research proposal, thesis and publication.
D1	dissertation and presentation, independent study, Presenting reports, Brainstorming,	Written research proposal, thesis and publication, Written Exam, Assignments,

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ILOs	Teaching Strategy	Assessment Methods
	Presenting researches, Publish research papers.	Experimental and field work, laboratory report, survey, presentation, written report.
D2	dissertation and presentation, independent study, Presenting reports, Brainstorming, Presenting researches, Publish research papers.	Written research proposal, thesis and publication, Written Exam, Assignments, Experimental and field work, laboratory report, survey, presentation, written report.
D3	dissertation and presentation, independent study, Presenting reports, Brainstorming, Presenting researches, Publish research papers.	Written research proposal, thesis and publication, Written Exam, Assignments, Experimental and field work, laboratory report, survey, presentation, written report.

Teaching Strategy	Description of the Main Strategy Used
Lectures.	These are interactive lectures weekly conducted according to course plan in a classroom and supported with variety of teaching formats including, lectures and multimedia presentations, use of whiteboard and solved examples, and class discussions, in which concepts, approaches, and case studies are presented, explored, and shown students what they need to know.
Independent study	Independent study is an individualized learning experience that allows students to select a topic focus, define problems or questions, gather and analyze information, apply skills, and create a product to show what has been learned.
Self-Learning.	Students are encouraged to undertake independent study to both supplement and consolidate what are being learned.
Active learning	
Computer hands-on sessions.	Practical applications using a variety of software before the real design and implementation. A variety of web-based searches students will be assigned to learn how they can search for solutions using the Web.
Simulation exercises	
Analysis and Problem Solving.	The study of Computer Engineering and Control involves applying knowledge and problem-based learning. This allows students to become more active in their learning as they work out what information, they need to find out how to solve a particular problem. They can work out a problem collaboratively, practice research as well as testing different components to come up with a valid solution.

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Teaching Strategy	Description of the Main Strategy Used
Laboratory works.	During laboratory sessions, students will be given experiments to work in groups where they can apply the theories and principles gained. This gives them the opportunity to have hands-on experience to design and conduct experiments in addition to analyzing, interpreting data obtained from experiments, and maximize their learning through actual simulation
Presentations/ Presenting researches	students present their work to the whole group, for discussion, criticism, and suggestions for improvement. Presentation sessions provide an opportunity to address questions, queries, and problems.
Project supervision	The teacher needs to set advance work for students, and then have the students present their work to the whole group, for discussion, criticism, and suggestions for improvement. Project sessions provide an opportunity to address questions, and problems.
Brain storming	Brainstorming is an effective technique for generating lists of ideas and creating interest and enthusiasm for new concepts or topics. Brainstorming provides teachers and students with an overview of what students know and/or think about a specific topic. Students can use brainstorming to organize their knowledge and ideas.
Dissertation	
Publish research	
Seminar	The teacher needs to set advance work for a selected number of students, and then have the selected students present their work to the whole group, for discussion, criticism, and suggestions for improvement. Seminar sessions provide an opportunity to address questions, queries, and problems.
Research activities	Research-led activities envisage activities in which students learn about current research in the discipline and are frequently an audience. The emphasis is put on the research content.

Assessment Strategy	Description of the main strategy used.
Written Exam	Mid-term test is conducted in the 8 <sup>th</sup> week and final exam is conducted at the end of each course. Both tests are closed or open book, notes and resources. At least two quizzes must be done through the course.

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Assessment Strategy	Description of the main strategy used.
Oral Discussion	To know the knowledge of the students.
Presentations	For Final Results displaying, to enhance the level of students in different subjects.
Quizzes	The entire assessment of Quizzes activities during the teaching period of each course.
Laboratory Reports	To demonstrate the personal skills, practical expertise, communication skills, report writing skills, and team work expertise they are expected to be learned and gained through their education.
Experimental and field work	For evaluation, to demonstrate the personal skills, practical expertise, communication skills, report writing skills, and team work expertise they are expected to be learned and gained through their education.
Survey	
Assignments	The entire assessment of coursework activities during the teaching period of each course (which includes group and individual work, tests and presentations, etc.)
Seminar	
Written report	
Written research proposal	
Thesis and publications	

### 12. Intended Learning Outcomes Mapping:

See Annex 10

### 13. Program Structure

Program Requirement	No. of Courses	Credit Hours	%
Complementary Courses	See List below.		
Faculty Requirement	1	3	8.33%
Compulsory Core Courses	6	18	50%

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Elective Courses	3	9	25%
Thesis	-	6	16.67%
<b>Total</b>	<b>10</b>	<b>36</b>	<b>100%</b>

Complementary Courses (00 hrs)						
No	Course Code	Course Title	L	T	P	Cr. Hrs.
1	CCE244	Object Oriented Programming (Programming Language 3)	2		2	3
2	CCE436	Introduction to Robotics	2		2	3
3	CCE334	Embedded Systems	2		2	3
4	CCE326	Artificial Intelligence	2		2	3
5	CCE323	Database Systems	2		2	3
6	CCE315	Computer Architecture & Organization	2		2	3
<b>Total</b>						<b>00</b>

Compulsory Courses (7 Courses, 21 C.H)						
No	Course Code	Course Title	L	T	P	Cr. Hrs.
1	CCE549	Advanced Probability & Statistics	3			3
2	CCE580	Advanced Embedded Systems Design	3			3
3	CCE555	Advanced Networking	3			3
4	CCE581	Advanced Robotics and Intelligent Control Systems	3			3
5	CCE556	Cryptography & Networks Security	3			3
6	CCE582	Applied Deep Learning	3			3
7	FR501	Research Methodology	3			3
<b>Total</b>			<b>21</b>			<b>21</b>

Elective Courses (3 Courses, 9 CH)						
No	Course Code	Course Title	L	T	P	Cr. Hrs.

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1	CCE570	Computer Visions and Pattern Recognition	3			3
2	CCE571	Advanced Database Management	3			3
3	CCE583	Advanced Digital Signal Processing	3			3
4	CCE548	Systems Modelling & Simulation	3			3
5	CCE560	Advanced Computer Architectures	3			3
6	CCE572	Advanced Software Engineering	3			3
7	CCE573	Big Data & Cloud Computing	3			3
8	FR502	Advanced Project Management	3			3
9	CCE561	Advanced Digital System Design	3			3
<b>Total</b>			<b>9</b>			<b>9</b>

### Thesis

The student must prepare and discuss a Thesis by (6) credit hours.

THESIS599 MS Thesis

### Thesis and Its Requirements

#### 1. Registration of the thesis:

(Requirements/conditions and procedures for registration of the thesis as well as controls, responsibilities and procedures of scientific guidance)

- Completion of the all required Compulsory & Elective Courses with average grade more than or equal to 75%.
- Field of Research as well as Point of research with short Description and suggested plan table.
- First Department Seminar.
- Decision letter (Supervisors) of acceptance of the research point.
- Thesis work should be done in at least 2-semesters.
- Thesis work should be done in at most 4-semesters.
- Any further requirements and controls based on post-graduate branch.

#### 2. Scientific Supervision:

(The regulations of the selection of the scientific supervisor and his/her responsibilities, as well as the procedures/ mechanisms of the scientific supervision and follow-up)

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### Thesis

- At most 2-supervisors are selected for the supervision of a thesis.
- At least 1-associate (or Full) Professor is appointed as supervisor either from the department or from another department outside the faculty.
- Any assist. Professor is appointed as supervisor should have at least 2-year experience in the field of research and at least 1-published paper.
- The supervisor responsibilities are: -
  - Help and assist the researcher in planning the research plan,
  - Monthly, follow and meet the researcher,
  - Guide the researcher for every next step to be done during thesis work,
  - Write follow-up (report) after each meeting.
  - Write a follow-up (report) every 3-months, upload copies of this period report to the master-program coordinator, the head of the department and the head of the post-graduate branch,
  - Write the final accept report for the thesis in order to prepare the final department seminar and then starting the preparation for the thesis presentation, defense and approval.

### 3.Thesis Defense/Examination:

(The regulations for selection of the defense/examination committee and the requirements to proceed for thesis defense, the procedures for defense and approval of the thesis, and criteria for evaluation of the thesis)

- A thesis is proceeded for defense after it support the following: -
  - At least 1-research paper is accepted and published by international journal related to the field of research.
  - Final acceptance letters provided by the supervisor(s) and the department final seminar committee (at least 3-department members),
- The examination committee should consist of: -
  - 1-Assoc. (or full) Professor specialized in the field of research from external university,
  - 1- Assoc. (or full) Professor from the department of electrical engineering
  - In addition to the supervisor of the thesis.
- A session for presentation, defense and approval of the thesis should be done based on the following: -
  - All members of the examination committee are accepting their assignment and replying by acceptance letter, that approve the thesis for defense, within 1-month.
  - The session of defense should be declared within 2-weeks after the receiving of examination committee members approve letters.
- The criteria of evaluation of the thesis are organized as follow: -
  - A total of 200 marks for the whole thesis evaluation.

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### Thesis

- 100 marks is stated by the supervisor, divided into 40 marks whole works (periods reports) evaluation of the researcher during thesis work period, 20 marks for the writing, 40 marks for the core work evaluation.
- 100 marks is stated by the examination committee, divided into 30 marks for thesis writing, 20 marks for the presentation document, and 20 marks for the discussion and researcher defense and 30 marks for the evaluation of the work done by the thesis.

### 14. System of Study

Type of program	Courses and Research
Study methods in the program:	Regular
The period to complete the program	Min. 2 Years (4 Semesters) Max. 3 Years (6 Semesters)
Total Credit Hours for courses & Research	36

### 15. Study Plan

FR stands for Faculty Requirements.

CEC5XX stands for Computer Engineering and Control Master's Courses Requirements.

#### First Semester

No.	Course Code	Course Name	اسم المقرر	Credit Hours				Prerequisites
				Lec.	Pr.	Tut.	Total C.H.	
1	CCE549	Advanced Probability & Statistics	مواضيع متقدمة في الاحتمالات والاحصاء	3			3	
2	CCE580	Advanced Embedded Systems Design	مواضيع متقدمة في تصميم الأنظمة المدمجة	3			3	
3	CCE555	Advanced Networking	مواضيع متقدمة في في الشبكات	3			3	
4	ELEC-I	Elective I	اختياري 1	3			3	
5	ELEC-II	Elective II	اختياري 2	3			3	
<b>Total Credit Hours</b>				<b>15</b>			<b>15</b>	

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Second Semester								
No.	Course Code	Course Name	اسم المقرر	Credit Hours				Prerequisites
				Lec.	Pr.	Tut.	Total C.H.	
1	CCE581	Advanced Robotics and Intelligent Control Systems	روبوتات متقدمة وانظمة التحكم الذكية	3			3	
2	CCE556	Cryptography & Networks Security	التشفير وامنية الشبكات	3			3	
3	CCE582	Applied Deep Learning	التطبيقات الهندسية في التعلم العميق للاله	3			3	
4	FR501	Research Methodology	منهجيات البحث العلمي	3			3	
5	ELEC-III	ELECTIVE III	اختياري 3	3			3	
<b>Total Credit Hours</b>				<b>15</b>			<b>15</b>	

Elective Courses (3 Courses, 9 CH)								
No.	Course Code	Course Name	اسم المقرر	Credit Hours				Prerequisites
				Lec.	Pr.	Tut.	Total C.H.	
1	CCE570	Computer Visions and Pattern Recognition	الرؤية بالكمبيوتر وتمييز الخواص	3			3	
2	CCE571	Advanced Database Management	مواضيع متقدمة في ادارة قواعد البيانات	3			3	
3	CCE583	Advanced Digital Signal Processing	معالجة اشارات رقمية متقدمة	3			3	
4	CCE548	Systems Modelling & Simulation	نمذجة ومحاكاة الأنظمة	3			3	
5	CCE560	Advanced Computer Architectures	معمارية الحاسوب المتقدمة	3			3	
6	CCE572	Advanced Software Engineering	هندسة البرمجيات المتقدمة	3			3	
7	CCE573	Big Data & Cloud Computing	البيانات الكبيرة والحوسبة السحابية	3			3	
8	FR502	Advanced Project Management	ادارة مشاريع متقدمة	3			3	
9	CCE561	Advanced Digital System Design	تصميم الأنظمة الرقمية المتقدمة	3			3	

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<b>Total</b>	9	9
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Course Code	Course Name	Cr. Hrs.
THESIS599	Research	6

### 16. Admission Requirements:

1. Bachelor of Computer Engineering & Control or any related disciplines Certificate with not less than 65 % passing ratio, or equivalent.
2. Interview
3. TOEFL / IBT: 65 or Equivalent
4. ICDL (Computer Skills):
5. Arabic Language:
6. Student number capacity of 20 students per year
7. Transfer Requirements, and Courses Equivalency
8. Annex -13: shows the Admission Requirements for the Program.

### 17. Graduation Requirements:

- Student attendance should not be less than 75%.
- Student will graduate after successfully passing the 30 credit hours courses and 6 credit hours Research.
- Student must achieve a minimum average score for all courses is 75% degree
- Minimum score for any student to pass any credit hours course is 65% degree.
- Grading System:
- |                                 |           |
|---------------------------------|-----------|
| From 90% to 100% of total marks | Excellent |
| From 80% to less than 90%       | Very Good |
| From 75% to less than 80%       | Good      |
| From 65% to less than 75%       | Pass      |
| Less than 65%                   | Poor/Fail |

### 18. Learning Resources, Facilities, and Equipment for Running the Program

- Learning Resources.**  
 Policies and Procedure for providing and quality assurance of learning resources textbooks, references and other resource materials, including electronic and web-based resources, Journal Database, etc.
- textbooks, reference
- university database which allows access to most of the international publishing houses
- Facilities and Equipment**  
 Policies and Procedure for providing and quality assurance of Facilities and Equipment (Library, laboratories (Structure, material Labs), medical facilities, classrooms, etc.).
- List of laboratories:**
- Computer Engineering Lab
  - Embedded Systems Lab

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Networking Lab
Electronic Library
College Central Library

19. Teaching staff:				
	Professor	Associate Professor	Assistant Professor	Technicians Assistants
Required Number	At least 1	At least 1	At Least 3	N.A
Available Number	1	1	5	
Note:				

20. Program Management and Regulations
<p><b>1. Program Management</b></p> <p><b>1.1 Program Structure</b>            (Including boards, councils, units, committees, etc.)</p> <p>Electrical Engineering Department Board            Postgraduate Studies Administration            Vice Dean for Postgraduate Studies            College of Engineering Board            Vice Presidency of the University for Postgraduate Studies</p>
<p><b>1.2 Stakeholders' Involvement</b>            Describe the representation and involvement of stakeholders in the program planning and development. (students, professional bodies, scientific societies, alumni, employers, etc.)</p> <p>The stakeholders were involved in designing the program, including universities, research centers, the public and private sectors, through their participation in a workshop as well as in responding to and submitting a questionnaire.</p>
<p><b>2. Program Regulations</b>            Provide a list of related program regulations, including their link to online version: admission, study and exams, recruitment, appeals and complaint regulations, etc.)</p> <p>Decision of the Presidency of the Council of Ministers No. 40 of 2008            Decision of the Presidency of the Council of Ministers No. 141 of 2008            Graduate Studies Guide to Sana'a University</p>

21. Evaluation of Program Quality Matrix:			
Evaluation	Evaluation	Evaluation Methods	Evaluation Time
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Areas/Aspects	Sources/References		

**Note:**

**Evaluation Areas/Aspects** (e.g., leadership, effectiveness of teaching & assessment, learning resources, partnerships, etc.)

**Evaluation Sources** (students, graduates, alumni, faculty, program leaders, administrative staff, employers, independent reviewers, and others (specify))

**Evaluation Methods** (e.g., Surveys, interviews, visits, etc.)

**Evaluation Time** (e.g., beginning of semesters, end of academic year, etc.)

### 22. List of Annexes

<b>Annex (1)</b>	Academic Standards Curriculum Criteria of Accreditation Board for electrical power engineering program.
<b>Annex (2)</b>	Survey of names of Similar Accredited Programs at International Universities (Benchmarks) for electrical power Engineering Programs.
<b>Annex (3)</b>	Survey of Intended Learning Outcomes for similar Accredited electrical power engineering Programs at International Universities.
<b>Annex (4)</b>	Summary of similar Programs (Benchmarks) for Master of Science in electrical power engineering Program.
<b>Annex (5-a, 5-b)</b>	5-a) Survey of Study planes of Similar Programs, 5-b) Survey of course names of Similar Programs.
<b>Annex (6)</b>	Survey/Mapping of Vision, Mission and Objectives of similar Accredited Programs at International Universities (Benchmarks) for Masters of Science in electrical power engineering programs.
<b>Annex (7)</b>	Mapping of the mission and objectives of the program with the vision, mission and objectives of faculty, and the university.
<b>Annex (8)</b>	Main Themes/Sub-Themes with Relative weight for Program (if need)
<b>Annex (9)</b>	PILOs Distribution to General Themes for Program (if need)
<b>Annex (10)</b>	Matrix of mapping program P- ILO's with courses
<b>Annex (11)</b>	Mapping the benchmarks with PILO's (if need)
<b>Annex (12)</b>	Mapping Program's Goals with Intended Learning Outcomes
<b>Annex -13</b>	The Admission Requirements for the Program.

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### 23. Attachment of Courses Specification and Syllabi of the Program

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ملحق (1) المعايير الأكاديمية للمحتوى لهيئة الاعتماد المقترحة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم

(Annex-1): Academic Standards Curriculum Criteria of Accreditation Board for Master of Science in Computer Engineering & Control program

1. ABET Effective for Reviews during the 2020-2021 Accreditation Cycle Incorporates all changes approved by the ABET Board of Delegates Engineering Area Delegation as of November 2, 2019, CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS - <http://www.ABET.org>
2. IET (Institute for Electronics & Technology) - <http://www.theiet.org/>

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ملحق (2) مسح أسماء البرامج المعتمدة المماثلة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم

Annex (2) Survey of names Similar Accredited Programs at International Universities (Benchmarks) for Master of Science in Computer Engineering & Control Program

#	The Academic Program اسم البرنامج المماثل	The University الجامعة	The Faculty الكلية	The Department القسم	The Country الدولة	Program Accrediting Body جهة اعتماد البرنامج	Degree Award at Program Completion التي يمنحها الدرجة البرنامج للخريج	Year of accreditation سنة الحصول على الاعتماد	Type of program
The 1 <sup>st</sup> Program البرنامج الاول	Master of Science in Computing-Computer Engineering <a href="http://www.qu.edu.qa/engineering/computer/ms/">http://www.qu.edu.qa/engineering/computer/ms/</a>	Qatar University: <a href="http://www.qu.edu.qa/">http://www.qu.edu.qa/</a>	COLLEGE OF ENGINEERING <a href="http://www.qu.edu.qa/engineering/graduate.php">http://www.qu.edu.qa/engineering/graduate.php</a>	Computing	Qatar	ABET	Master of Science in Computing	2005	Mixed
The 2 <sup>nd</sup> Program البرنامج الثاني	COMPUTER SCIENCE AND ENGINEERING	ANNA UNIVERSITY, CHENNAI <a href="http://www.cac.annauniv.edu">www.cac.annauniv.edu</a>	Faculty of Information and Communication Engineering	COMPUTER SCIENCE AND ENGINEERING	India	NAAC	M.E. COMPUTER SCIENCE AND ENGINEERING	---	Mixed

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#	The Academic Program اسم البرنامج المماثل	The University الجامعة	The Faculty الكلية	The Department القسم	The Country الدولة	Program Accrediting Body جهة اعتماد البرنامج	Degree Award at Program Completion التي يمنحها الدرجة البرنامج للخريج	Year of accreditation سنة الحصول على الاعتماد	Type of program
The 3 <sup>rd</sup> Program البرنامج الثالث	Master program of Computer Engineering	ATILIM University <a href="https://www.atilim.edu.tr/en/compe/page/3944/mudek-accreditation-certificate">https://www.atilim.edu.tr/en/compe/page/3944/mudek-accreditation-certificate</a>	School of Engineering	Computer Engineering Department	Turkey	MÜDEK	Master's Degree in Computer Engineering	2014 to Undergrad. Programs	Mixed
The 4 <sup>th</sup> Program البرنامج الرابع	Computer Engineering M.S.	Air Force Institute of Technology <a href="https://www.afit.edu/ENG">https://www.afit.edu/ENG</a>	Graduate School of Engineering & Management	Electrical & Computer Engineering Department	United States	ABET	M. S. in Computer Engineering	2019/2020	Mixed
The 5 <sup>th</sup> Program البرنامج الخامس	Computer Science and Engineering	University of Louisville <a href="http://www.engineering.louisville.edu">http://www.engineering.louisville.edu</a>	Graduate School	Computer Science and Engineering	United States	ABET	Master of Engineering in Computer Science and Engineering degree program	2019-2020	Mixed
The 6 <sup>th</sup> Program البرنامج السادس	Control Systems	Imperial College London <a href="http://www.imperia">http://www.imperia</a>	Faculty of Engineering	Department of Electrical and Electronic	United Kingdom	IET- <a href="http://www.theiet.org/">http://www.theiet.org/</a>	MSc in Control Systems	2013, Renewed 2018	Courses & research

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#	The Academic Program اسم البرنامج المماثل	The University الجامعة	The Faculty الكلية	The Department القسم	The Country الدولة	Program Accrediting Body جهة اعتماد البرنامج	Degree Award at Program Completion التي يمنحها الدرجة البرنامج للخريج	Year of accreditation سنة الحصول على الاعتماد	Type of program
السادس		<a href="http://lac.uk">Lac.uk</a>		Engineering					Project

ملحق (3) مسح مخرجات التعلم في البرامج المماثلة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم

### Annex-3, Survey of Intended Learning Outcomes for Similar Accredited for Master of Science in Computer Engineering & Control Program at International Universities

Program Intended Outcomes	Suggested PILOs for the Current Program: Computer Engineering & Control Program at Sanaa University		1st Program	2nd Program	3rd Program	4th Program	5th Program	6th Program
	A. Knowledge and understanding	A1.	Demonstrate deep understanding of computer engineering and control as well as knowledge of applied mathematics and engineering science to the field of computing and intelligent control.			√-(1)		√-(1)

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Program Intended Outcomes	Suggested PILOs for the Current Program: Computer Engineering & Control Program at Sanaa University		1st Program	2nd Program	3rd Program	4th Program	5th Program	6th Program
A2.	Recognize and explain the contemporary engineering technologies and issues in the specialization field of computing and control.		√-(4)	√-(4)	√-(1)	√-(10)	√-(A.2)	
A3.	Explain in-depth the principles of sustainable design and development of computing products, standards and protocols and intelligent control systems.	√-(3)	√-(5)			√-(8)		
B. Cognitive/ Intellectual Skills	<b>Upon successful completion of a Master of Science in Computer Engineering &amp; Control program, graduates should be able to:</b>							
	B1.	Evaluate, select and apply appropriate principles, methodologies, techniques, tools and packages to the analysis, specification, development and evaluation of computing and engineering systems.			√-(4)	√-(4)		√-(B.3)
	B2.	Identify, formulate, analyze and solve research and complex engineering problems.			√-(2, 12)		√-(5)	√-(B.1)

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Program Intended Outcomes	Suggested PILOs for the Current Program: Computer Engineering & Control Program at Sanaa University		1st Program	2nd Program	3rd Program	4th Program	5th Program	6th Program
	B3.	Propose computing system, component, or process to meet desired needs within realistic constraints.	√-(4)		√-(3)		√-(3)	
<b>C. Practical and Professional Skills</b>	<b>Upon successful completion of a Master of Science in Computer Engineering &amp; Control program, graduates should be able to:</b>							
	C1.	Develop, configure, upgrade, and/or write computer software/program to solve computing and control problems.	√-(4)	√-(1)	√-(12)			√-(C.4)
	C2.	Use and apply advanced methodology and skills to the formulation and practice of computer science, engineering and control systems.		√-(4)	√-(4, 13)		√-(11)	
	C3.	Employ acquired knowledge into a philosophical and intellectual frame that can be applied to computer engineering & control systems and process design and implementation.	√-(4)			√-(3)	√-(3)	√-(C.3)

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Program Intended Outcomes	Suggested PILOs for the Current Program: Computer Engineering & Control Program at Sanaa University		1st Program	2nd Program	3rd Program	4th Program	5th Program	6th Program
<b>D.</b> <b>General and Transferable Skills</b>	<b>Upon successful completion of a Master of Science in Computer Engineering &amp; Control program, graduates should be able to:</b>							
	<b>D1.</b>	Prepare complete thesis and reports, present ideas clearly and defend them	√-(1)	√-(3)	√-(7)	√-(4)	√-(7)	
	<b>D2.</b>	Balance professional and ethical responsibilities including contemporary issues and environmental awareness		√-(3)	√-(9, 11)	√-(0)	√-(6)	
	<b>D3.</b>	Conduct independently and communicate research that advances and extends computing knowledge and scholarship in relate.	√-(1)	√-(1)	√-(5)	√-(2, 3)	√-(7)	√-(D.7)

### Intended Outcomes for Similar Programs

#### Program 1: Master of Science in Computing-Computer Engineering, Qatar University, QATAR

- 1) Conduct independent research or project to solve a specific problem in the field of computing
- 2) Analyze, assimilate and produce technical documents in computing

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- 3) Recognize professional computing practices in realistic contexts such as global, economic, environmental, and/or social issues.
- 4) Design and evaluate a computer-based system, process, or component to meet desired needs.
- 5) Engage in self-directed lifelong learning.

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### Program 2: M.E. COMPUTER SCIENCE AND ENGINEERING, Anna University, India

Engineering Graduates will be able to:

PO #	Graduate Attribute	Program Outcomes
1.	Research Aptitude	An ability to independently carry out research / Investigations, identify problems and develop solutions to solve practical problems.
2.	Technical documentation	An ability to write and present a substantial technical report/ document.
3.	Technical competence	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
4.	Handle complex problems	Use research-based knowledge, methods, appropriate techniques, resources and tools to solve complex engineering issues with an understanding of the limitations.
5.	Environmental Sustainability and societal Ethics	Ensure development of socially relevant and eco friendly indigenous products by applying technical knowledge, ethical principles and, sound engineering practices
6.	Life-long learning	Recognize the need for independent, life-long learning and engage in the broadest context of technological change.

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### **Program 3: Master in Computer Engineering, ATILIM University, Turkey**

- 1) Adequate knowledge in mathematics, science and subjects specific to the computer engineering discipline; the ability to apply theoretical and practical knowledge of these areas to complex engineering problems.
- 2) The ability to identify, define, formulate and solve complex engineering problems; selecting and applying proper analysis and modeling techniques for this purpose.
- 3) The ability to design a complex system, process, device or product under realistic constraints and conditions to meet specific requirements; the ability to apply modern design methods for this purpose.
- 4) The ability to develop, select and utilize modern techniques and tools essential for the analysis and determination of complex problems in computer engineering applications; the ability to utilize information technologies effectively.
- 5) The ability to design experiments, conduct experiments, gather data, analyze and interpret results for the investigation of complex engineering problems or research topics specific to the computer engineering.
- 6) The ability to work effectively in inter/inner disciplinary teams; ability to work individually.
- 7) Effective oral and written communication skills in Turkish; the knowledge of at least one foreign language; the ability to write effective reports and comprehend written reports, to prepare design and production reports, to make effective presentations, to give and to receive clear and understandable instructions.
- 8) Recognition of the need for lifelong learning; the ability to access information, to follow recent developments in science and technology.
- 9) The ability to behave according to ethical principles, awareness of professional and ethical responsibility; knowledge of the standards utilized in computer engineering applications.

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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- 10) Knowledge on business practices such as project management, risk management and change management; awareness about entrepreneurship, innovation; knowledge on sustainable development.
- 11) Knowledge on the effects of computer engineering applications on the universal and social dimensions of health, environment and safety; awareness of the legal consequences of engineering solutions.
- 12) An ability to describe, analyze and design digital computing and representation systems.
- 13) An ability to use appropriate computer engineering concepts and programming languages in solving computing problems.

### Program 4: M. S. in Computer Engineering, AFIT, US

Student Outcomes (SOs): -

- 1) Graduates will demonstrate an in-depth understanding of computer engineering
- 2) Graduates will be able to communicate technical information clearly by written and oral means
- 3) Graduates will conduct independent research on topics related to computer engineering, including identifying and scoping a problem, locating and synthesizing relevant published prior work, planning and executing valid research, documenting results, and publishing them
- 4) Graduates will be able to apply the scientific method and use reliable standards of evidence for conclusions reached
- 5) Graduates will independently learn technical details for which they are responsible

### Program 5: Master of Engineering in Computer Science and Engineering degree program, University of Louisville, US

The Master of Engineering has the following outcomes set for its graduates. Graduates will demonstrate:

- 1) An ability to apply knowledge of mathematics, science, and engineering in the field of Computer Science and Engineering
- 2) An ability to design and conduct experiments, as well as to analyze and interpret data in the field of computer science and engineering
- 3) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability in the field of computer science and engineering

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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- 4) An ability to function on multidisciplinary teams
- 5) An ability to identify, formulate and solve problems in the field of computer science and engineering
- 6) An understanding of professional and ethical responsibility in the field of computer science and engineering
- 7) An ability to communicate effectively
- 8) The broad education necessary to understand the impact of computer science and engineering in a global, economic, environmental, and societal context
- 9) A recognition of the need for and an ability to engage in life-long learning in the field of computer science and engineering
- 10) Knowledge of contemporary issues in the field of Computer Science and Engineering
- 11) An ability to use the techniques, skills, and engineering tools for the practice of computer science and engineering

### Program 6: MSc in Control Systems, Imperial College-London, UK

#### Knowledge and understanding of:

- 1) Fundamental concepts and principles underpinning control system theory and design, including those associated with linear and non-linear deterministic systems, stochastic systems, modelling, optimization, control system design, on-line control.
- 2) The essential facts, concepts, principles and theories relevant to the student's chosen area of research for the individual project;
- 3) Information retrieval as a research technique;
- 4) Management and communication skills, including problem definition, project design, decision processes, written reports, scientific publications.

#### Intellectual (thinking) skills - able to:

- 1) (Analysis) model systems mathematically and apply relevant theory to study their properties and performance;

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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- 2) (Synthesis) apply control concepts and theory to the solution of control problems;
- 3) (Computing) apply computational principles and techniques to control problems;
- 4) (Evaluative) plan, conduct and report on a program of original research.

**Practical skills – able to:**

- 1) Formulate mathematical models of systems and identify the parameters of such models from observations using appropriate statistical techniques;
- 2) Solve control analysis and synthesis problems using appropriate statistical, frequency response and state-space methods;
- 3) Analyze and interpret computed results;
- 4) Write programs using at least one common language (Matlab);
- 5) Understand the literature so personal knowledge and skills can be kept up-to-date;
- 6) Define problems and design /manage associated projects;
- 7) Write effective technical reports

**Transferable skills – able to:**

- 1) Communicate effectively, as a result of clear and precise thinking, using presentations, webpages and written reports;
- 2) Apply knowledge skills to new control problems;
- 3) (Management skills) formulate problem definitions; design and evaluate projects using objective criteria;
- 4) Transfer techniques and solutions from one discipline to another;
- 5) Use Information and Communications Technology;
- 6) Manage resources and time;
- 7) Learn independently with open-mindedness and critical enquiry;
- 8) Learn effectively for the purpose of continuing professional development.

Head of the Department	Quality Assurance Unit	Dean of the Faculty	Academic Development
Adel Al-Shokiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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## Program Specification

ملحق (4) مسح ملخص البرامج المماثلة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم

**Annex-4, Summary of Similar Programs (Benchmarks) for Master of Science in Computer Engineering & Control Program**

1. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program							
	The Similar Programs (Benchmarks)						Current program
	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program	
<b>The Program Title</b>	Master of Science in Computing- Computer Engineering	COMPUTER SCIENCE AND ENGINEERING	Master program of Computer Engineering	Computer Engineering M.S.	Computer Science and Engineering	Control Systems	<b>Master of Science in Computer and Control Engineering</b>
<b>The Faculty</b>	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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## Program Specification

1. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program							
The University	Qatar University	ANNA UNIVERSITY, CHENNAI	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College, London	Sanaa University
The Country	Qatar	India	Turkey	U S	U S	U K	Yemen
Type of program	Courses & Thesis	Courses & Project	Courses + Thesis	Courses & Thesis	Courses & Thesis	Courses & Projects	Courses and Thesis
Study methods in the program:	Regular	Regular	Full Time	Full Time	Full Time	Full Time	Regular
Number of semesters	4	4	4	4	4	1 academic Year (12-months)	4
Total Credit Hours (without Thesis)	25	52	21-Crd. (40-ECTS)	36	24	50 (50*0.6=30)	30
Credit Hours for	19	35	9-Crd. (20-	24 + 12 for Application	12	20 with 10-	21

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1. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program							
compulsory courses			ECTS)	Sequence		Lab	
No. of Courses for Electives courses	2	5	4	--	2-course + 1 Technical	4	3
No. of Courses for compulsory courses	7	(8 Courses + 1 Open Elective) with 5-Labs	4	6	4	4	7
Credit Hours for Electives courses	6	17	12-Crd. (20-ECTS)	--	12	20 (20*0.6=12)	9
Complementary courses to join the program and their number							6 courses
Credit Hours for Thesis	6	18	0-Crd. (80 ECTS)	12	6	40 (0.6*40=27)	6

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1. Summary of Similar Programs (Benchmarks) for Computer Engineering & Control Program							
Total Credit Hours for courses & Thesis	31	70	21-Crd. (120 ECTS)	48	30	90 (0.6*90 =54)	36
The period for thesis completion	2-Semesters	2-Semesters	2-Semesters	2-Semesters	2-Semesters	7-months partially in parallel with courses	2-Semesters
The min. period to complete the program	2-y	4-Semesters	2-y	2-y	2-y	1- Ac. Year	2-y
The max. period to complete the program		12-Semesters*			Up to 6-y		Up to 4-y

\*Includes the period of break of study.

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ملحق (أ-5) مسح الخطط الدراسية في البرامج المماثلة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم  
 nnex-5-a, Survey of Study Planes of Similar Program

University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	Faculty of Engineering
Program	Master of Science in Computing-Computer Engineering	COMPUTER SCIENCE AND ENGINEERING	Master program of Computer Engineering	Computer Engineering M.S.	Computer Science and Engineering	Control System	Master of Science in Computer Engineering & Control
Country	Qatar	India	Turkey	US	US	UK	Yemen
No. of Courses	9	13	8	6	6+ 1-Technical	8 Course + 1-Lab	10 Courses
Total Cr. Hrs.	25 of 31	52 of 70	21-Cr (40 ECTS of 120 ECTS)	(24 -course+12 Application Sequence) =36 of 48	24 of 30 (Min 30-Cr)	50 of 90 ECTS (*0.6 = 30 of 54)	30 of 36
Total Years	2-Years	2-Years (4-Semesters)	2-Years	2-Years	2-Years	1-Ac. Year	2-Years
Term	No	Course Name	Course Name	Course Name	Course Name	Course Name	Course Name

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University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University	
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	Faculty of Engineering	
1	1	Applied Research Methodology	Advanced Mathematics for Scientific Computing	Advanced Computer Networks	Mathematics	Select one of the following sequences: 3-4 Sequence One: CECS 611 Computer Architecture Sequence Two: CECS/ECE 510 Computer Design ECE 511 Computer Design Laboratory	Elective group (A)**	Advanced Probability & Statistics
	2	Focus Area Elective	Data Structures and Algorithms	Advanced Databases	Theory	Experimental Design in Engineering or CECS 620 Combinatorial Optimization and	Elective group (A)**	Advanced Embedded Systems Design

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University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
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					Modern Heuristics		
3	Major Elective	Multi Core Architectures	Research Methodology and Communication Skills	Microprocessor Design and Synthesis	CECS Electives1 (4-cr or 5-cr)	Elective group (A/B)	<b>Advanced Networking</b>
4		Networking Technologies	Graduation Seminar (0-Cred.)	Advanced Microprocessor Design Lab	Technical Elective1 (1-cr)	Elective group (A/B)	<b>Elective I</b>
5		Research Methodology and IPR				Elective group (B)***	<b>Elective II</b>
6		Audit Course – I*					
7		Data Structures and Algorithms <b>Laboratory</b>					
8		Networking					

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University	
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	Faculty of Engineering	
		Laboratory						
	9	19	9-Cr (20-ECTS)	16	11 or 12	25 ECTS (25*0.6=15)	15	
2	1	Algorithm Design and Modeling	Advanced Operating Systems	Area Elective 1*	Design Principles of Computer Architecture	CECS Electives2	Elective group (A)**	Advanced Robotics and Intelligent Control Systems
	2	Seminar in Computing	Compiler Optimization Techniques	Area Elective 2*	Design and Analysis of Algorithms	Simulation and Modeling of Discrete Systems	Elective group (A)**	Cryptography & Networks Security
	3	Major Elective	Machine Learning	Area Elective 3*	Application Sequence (12-Cr)	Parallel Programming	Elective group (A/B)	Applied Deep Learning
	4	Focus Area Elective	Program Elective I	Area Elective 4*		Technical Elective3	Individual Research Project	Research

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University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University	
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>	
						(in 7-months)	<b>Methodology</b>	
	5	Program Elective II				C1 Lab	<b>ELECTIVE III</b>	
		Audit Course –II*						
		Machine Learning Techniques <b>Laboratory</b>						
		Professional <b>Practices</b>						
	10	20	12-Cr (20-ECTS)	20	12 or 13	65	15	
	No	Course Name	Course Name	Course Name	Course Name	Course Name	Course Name	
3	1	Focus Area Elective	Program Elective III	Thesis	Thesis	Technical Elective3	Project during 2 <sup>nd</sup> and 3 <sup>rd</sup> Semesters	Thesis Part I

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	2	Focus Area Elective	Program Elective IV			Thesis	
	3	Master Thesis	Program Elective V				
	4		Open Elective				
	5		Dissertation I				
	9	19	0-Cr (40-ECTS)	6	4	25 ECTS	3
4	1	Master Thesis	Dissertation II	Thesis	Thesis	Thesis	Thesis Part II
	2						
	3						
	4						
	5						
	3	12	0-Cr (40-ECTS)	6	3		3
<b>Total CH</b>	<b>31</b>	<b>70</b>	<b>21</b>	<b>48</b>	<b>30</b>	<b>90 ECTS (*0.6 =</b>	<b>36</b>

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
						<b>54-Cred.)</b>	
<b>Elective Courses</b>							
	<b>Qatar</b>	<b>ANNA</b>	<b>ATILIM</b>	<b>AFIT</b>	<b>Louisville</b>	<b>Imperial College</b>	<b>Sanaa</b>
<b>1</b>	Embedded Computing Systems	Advanced Database	Object-Oriented Design and Programming		Survey of Computer Engineering and Computer Science	Control Engineering (A)	Computer Visions and Pattern Recognition
<b>2</b>	Network Security	Technology and Design	Computer and Network Security		Automata Theory	Design of Linear Multivariable Control Systems (A)	Advanced Database Management
<b>3</b>	Applied Digital Signal processing	Cloud Computing Technologies	Current Trends in Internetworking Technologies		Computer Communications Networks	Discrete-time Systems and Computer Control (A)	Advanced Digital Signal Processing
<b>4</b>	Human	Ethical Hacking	Advanced Multimedia		Performance Evaluation of	Stability and Control of Non-	Systems

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
	Computer Interaction		Systems		Computer Systems	linear Systems (A)	Modelling & Simulation
5	Web Development	Digital Image and Video Processing	Advanced Operating Systems		Microcomputer Design	Discrete-Event Systems (B)	Advanced Computer Architectures
6	Big Data Analytics	Principles of Cryptography	Advanced Computer Architecture		Game Design and Programming	Mathematics for Signals and Systems (B)	Advanced Software Engineering
7	Enterprise Information Systems	Internet of Things	Parallel and Cluster Computing		Design of Compilers	Optimization (A)	Big Data & Cloud Computing
8	Simulation and Modeling	Advanced Software	Advanced Algorithms		Data Management and Analysis	Predictive Control (A)	Advanced Project

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			



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Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
	in Computer Networks	Engineering					Management
<b>9</b>	Information Security	Deep Learning	Advanced Artificial Intelligence		Object Oriented Information Technology	Probability and Stochastic Processes (B)	Advanced Digital System Design
<b>10</b>	Next are Focus Area Electives	Web Content Design and Management	Multiagent Systems		Computer Control and Real Time Programming	Systems Identification (A)	
<b>11</b>	Advanced Database System	Semantic Web	Natural Computing		Advanced Artificial Intelligence	Estimation and Fault Detection (A)	
<b>12</b>	Advanced Software	Mobile Application Development	Machine Learning		Introduction to Cryptography	Power System Dynamics, Stability and Control (B)	

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
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	Engineering						
<b>13</b>	Machine Learning	Cryptocurrency and	Advanced Software Project Management		Information Security	Topics in Control Systems (B)	
<b>14</b>	Special Topics in Computer Science	Blockchain Technologies	Service Oriented Architecture and Business Process Management		Computer Forensics	Game Theory (B)	
<b>15</b>	Distributed Systems and Cloud Computing	Multimedia Systems and Applications	Systems Integration		Mobile Device Program	Wavelets and Applications (B)	
<b>16</b>	Information Retrieval	Information Retrieval	Cloud Computing		Special Topics in Computer Engineering and	Traffic Theory & Queuing Systems (B)	

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
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Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering Techniques	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
<b>17</b>		Big Data Mining and Analytics	Big Data Analytics		Independent Study in Computer Engineering and Computer Science	Coding Theory (B)	
<b>18</b>		Parallel Algorithms	Advanced Network Programming		Advanced Design of Operating Systems	Information Theory (B)	
<b>19</b>		Cyber Security	Advanced Data Mining		Multimedia Processing	Real-time Digital Signal Processing (B)	
<b>20</b>		Soft Computing	Information Retrieval		Distributed System Design	Selected topics in Computer Vision (B)	
<b>21</b>		Game Theory	Biometric Identification and Verification Systems		Advanced Databases	Pattern Recognition (B)	

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
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## Program Specification

University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
22		Adhoc and Wireless Sensor Networks	Penetration Testing		Intelligent Systems		
23		Software Security	Cyber Security		Computer Vision		
24		Cognitive Science	Semantic Web Programming		Computer Engineering and Computer Science Seminar		
25		Virtualization Techniques	Distributed Computing		Introduction to Bioinformatics		
26		Database Administration and Tuning	Java Programming				

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

**University of Sana'a**  
**Faculty of Engineering**  
**Department: Electrical Engineering**  
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**Master of Science in Computer Engineering & Control**



## Program Specification

University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
27		Data Warehousing and Data Mining Techniques	Agile Methods in Software Development				
28		Social Network Analysis	Operating Systems				
29		Software Testing and Quality Assurance	Organizational Management and Change				
30			Software Engineering				
31			Agile Software Development Approaches				

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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**Department: Electrical Engineering**  
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## Program Specification

University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
32			IT Strategy Planning and Governance				
33			Object-Oriented Analysis and Design				
34			Software Testing and Maintenance				
35			Digital Image Processing				
36			Distance Education and E-Learning				
37			Business Process Management				
38			Mathematical Modeling via Differential and				

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## Program Specification

University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
			Difference Equations				
39			Software Quality Management				
40			Requirements Engineering				
41			Database Design and Management				
42			Data Warehousing and Mining				
43			Advanced Digital Design with HDL				
44			Cognitive Aspects of Software Engineering				
45			Applied Machine Learning in Data Analytics				
46			Blockchain and Cryptocurrency Technologies				

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

**University of Sana'a**  
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**Department: Electrical Engineering**  
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## Program Specification

University	Qatar	ANNA University, Chennai	ATILIM University	AFIT	Louisville University	Imperial College	Sanaa University
Faculty	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering	<b>Faculty of Engineering</b>
47			Fundamentals of the Internet of Things				
48			Introduction to Data Science				
49			Introduction to Recommender Systems				

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			



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## Program Specification

ملحق (5-ب) جدول مسح المقررات الدراسية للبرامج المماثلة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم  
 Annex-5-b, Survey of Courses Names of Similar Program

#	Sana'a University					Qatar					ANNA University, Chennai					ATILIM University					AFIT					Louisville University					Imperial College							
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours						
		C	L	T	P		C	L	T	P		L	T	P	C		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P			
1	Advanced Probability & Statistics										Advanced Mathematics for Scientific Computing											Mathematics											Probability and Stochastic Processes (B)					
2	Advanced Embedded Systems Design					Embedded Computing Systems																Microprocessor Design and Synthesis + Lab						Microcomputer Design										
3	Advanced Networking										Networking Technologies						Advanced Computer Networks											Computer Communications Networks										
4	Advanced Robotics and Intelligent Control Systems															Advanced Artificial Intelligence											Computer Control and Real Time Programming						Control Engineering (A)+ Design of Linear Multivariable Control					

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#	Sana'a University					Qatar					ANNA University, Chennai					ATILIM University					AFIT					Louisville University					Imperial College																																																						
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours																																																										
		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P																																																							
5	Cryptography & Networks Security					Network Security					Cryptocurrency and Blockchain Technologies					Computer and Network Security + Blockchain and Cryptocurrency Technologies										Introduction to Cryptography + Information Security															Systems (A)+ Predictive Control (A)																																												
6	Applied Deep Learning					Machine Learning					Machine Learning + Lab					Natural Computing + Machine Learning + Applied Machine										Intelligent Systems + Advanced Artificial Intelligence															Game Theory (B)																																												

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#	Sana'a University					Qatar					ANNA University, Chennai					ATILIM University					AFIT					Louisville University					Imperial College										
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours														
		C	L	T	P		C	L	T	P		L	T	P	C		H	C	L	T		P	C	L	T		P	C	L	T	P	C	L	T	P						
																Learning in Data Analytics																									
7	Research Methodology					Applied Research Methodology					Research Methodology and IPR					Research Methodology and Communication Skills											Data Management and Analysis														
8	Computer Vision and Pattern Recognition										Digital Image and Video Processing					Digital Image Processing											Computer Vision						Selected topics in Computer Vision (B) + Pattern Recognition (B)								
9	Advanced Computer Architectures										Multi Core Architectures					Advanced Computer Architecture						Design Principles of Computer Architecture						Computer Architecture													
10	Advanced Digital					Applied Digital					Multimedia Systems					Advanced Multimedia											Multimedia						Mathematics for								

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#	Sana'a University					Qatar					ANNA University, Chennai					ATILIM University					AFIT					Louisville University					Imperial College				
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours								
		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P	C	L	T	P	
	Signal Processing					Signal processing					and Applications					a Systems										Processing					Signals and Systems (B) + Real-time Digital Signal Processing (B)				
11	Systems Modelling & Simulation					Simulation and Modeling in Computer Networks																				Simulation and Modeling of Discrete Systems									
12	Advanced Database Management					Advanced Database System					Advanced Database					Advanced Databases										Advanced Databases									
13	Advanced Software Engineering					Advanced Software Engineering					Advanced Software Engineering					Advanced Software Project																			

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#	Sana'a University					Qatar					ANNA University, Chennai					ATILIM University					AFIT					Louisville University					Imperial College						
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours					
		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		C	L	T	P		
													Management + Agile Methods in Software Development																								
14	Advanced Digital System Design												Advanced Digital Design with HDL									Computer Design + Lab															
15	Big Data & Cloud Computing				Big Data Analytics								Cloud Computing + Big Data Analytics									Parallel Programming + Distributed System Design															
16																																					
17	Thesis				Thesis				Thesis				Thesis				Thesis				Thesis				Individual Project												
18																																					
19																																					

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Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			

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## Program Specification

ملحق ( 6 ) مسح الرؤية والرسالة والاهداف البرامج المعتمدة المماثلة لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم

### Annex (6) Survey/ Mapping of Vision, Mission and Objectives of Similar Accredited Programs at International Universities (Benchmarks) for Master of Science in Computer Engineering & Control program

	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
<b>Faculty</b>	COLLEGE OF ENGINEERING	Faculty of Information and Communication Engineering	School of Engineering	Graduate School of Engineering & Management	Graduate School	Faculty of Engineering
<b>Department/ Program</b>	Computing / Master of Science in Computing	COMPUTER SCIENCE AND ENGINEERING / COMPUTER SCIENCE AND ENGINEERING	<b>Computer Engineering / Computer Engineering</b>	Electrical & Computer Engineering Department / Computer Engineering M.S.	Computer Science and Engineering / Computer Science and Engineering	Department of Electrical and Electronic Engineering / Control Systems
<b>Study Duration</b>	2-Years	2-Years	2-Years	2-Years	2-Years	1 Ac. Year
<b>Program Accrediting Body</b>	ABET	NAAC	MÜDEK	ABET	ABET	IET
<b>Website Link</b>	<a href="http://www.qu.edu.qa/engin">http://www.qu.edu.qa/engin</a>	<a href="http://www.cac.annauniv.edu">www.cac.annauniv.edu</a>	<a href="https://www.atilim.edu.tr/en/c">https://www.atilim.edu.tr/en/c</a>	<a href="https://www.afit.ed">https://www.afit.ed</a>	<a href="http://www.engineer">http://www.engineer</a>	<a href="http://www.imperia">http://www.imperia</a>

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
	<a href="#">eering/computer/ms/</a>		<a href="#">ompe/</a>	<a href="#">u/ENG</a>	<a href="#">ing.louisville.edu</a>	<a href="#">l.ac.uk</a>
<b>Department Vision</b>	Become a regional leader in providing high-quality education and research in the area of computer science and engineering.	The Department of Computer Science and Engineering strives to create computing professionals, researchers, and entrepreneurs, with high technical knowledge, communication skills, values and ethics. It collaborates with academia, industry and community to set high standards in academic excellence and in fulfilling societal responsibilities.	To be an internationally recognized department having highly qualified and expert faculty and provide its students an effective dynamic research and education environment.			

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
<b>Department Mission</b>	The department mission is to: Enrich society and advance computer science and engineering by preparing graduates with the knowledge, ability, and skill to become innovators and leaders who are able to contribute to the aspirations of the country; Benefit humanity through research, creativity, problem-solving, and application development; Share knowledge and expertise to benefit the	The mission of the Department of Computer Science and Engineering is to <ul style="list-style-type: none"> <li>• Provide motivated faculty and state of the art facilities for education and research, both in foundational aspects and of relevance to emerging computing trends.</li> <li>• Develop knowledgeable, industry-ready students with pertinent competencies.</li> <li>• Inculcate responsibility through sharing of knowledge and innovative</li> </ul>	To raise computer engineers who are educated in an advanced technology supported environment, capable of learning and searching independently, technologically well qualified and also sensitive to social issues.	<b>School Mission:</b> - The mission of the AFIT Graduate School of Engineering and Management is to produce outstanding technical leaders in the Department of Defense by providing superior graduate education built on defense-focused research. The vision of the	<b>Mission Statement of the Graduate School</b> The mission of the Graduate School is to advocate and provide support for graduate education, graduate students, and interdisciplinary programs, and to promote the advancement of knowledge through the teaching and training of post-baccalaureate students.	

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
	country, the region, and beyond while inspiring people to engage in computing fields. The department is responsive to local cultural values as it excels in education, research, and community contributions.	<p>computing solutions that benefit the society-at-large.</p> <ul style="list-style-type: none"> <li>Engage in collaborative research with academia and industry for seamless transfer of knowledge resulting in patentable solutions.</li> <li>Generate adequate resources for research activities from sponsored projects and consultancy.</li> </ul>		AFIT Graduate School of Engineering and Management is to be internationally recognized as the school of choice in engineering and applied science for defense focused and research-based graduate education.	<p>Through its graduate courses, it furnishes advanced preparation for those who are planning to become investigators or teachers in the social sciences, humanities, and natural sciences.</p> <p>It also partners with the academic units to support graduate students, financially and professionally, and help those units recruit, retain, and</p>	

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
					prepare students for successful careers.	

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
<b>Department Objectives</b>			Qualified as Computer Engineers after successfully completing undergraduate program offering required in-depth and comprehensive scope of Computer Engineering subjects with help of solid practice targeting mathematics and physics background, and capable to track the developments in the field, capable to learn independently through researching and to use the outcomes in solution of the existing problems or improvement of current			

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
			solutions, our students, sensitive to social issues, can, in near future, work as: <ul style="list-style-type: none"> <li>• Team/Project Member</li> <li>• Team/Project Manager</li> <li>• System Operator</li> <li>• Researcher/Academician</li> <li>• Entrepreneur.</li> </ul>			
<b>Program Mission</b>			MS program aims at giving expertise in the field of Computer Engineering for the graduates of Informatics/Computer related programs, and for the graduates from the other disciplines by providing all the required background and high-level proficiency in the			The Research Program of the Control and Power Group combines curiosity-led and applications-led research in the domains of control systems,

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
			software area in an attempt to fill the vacancy and in the field.			power electronics, power systems, and smart grids.
<b>Program Objectives</b>	Objectives Graduates of this program will be able to fulfill some of the following objectives: 1. Establish successful computing careers in industry or government that will advance the economic development of the country and the region. 2. Serve industry or government by	1. To provide high quality graduate education in computer science by enhancing teaching effectiveness, refining curriculum to keep the program current with the rapidly changing computer technology and providing equipment/facilities for students to access	1. An ability to apply knowledge of mathematics, science, and engineering. 2. An ability to design and conduct experiments, as well as to analyses and interpret data. 3. An ability to design a system, component, or process to meet desired needs. 4. An ability to function on multi-disciplinary domains. 5. An ability to identify,	Breadth. Apply foundational scientific concepts and sound engineering principles to efficiently and effectively advance Air Force and DoD technological capabilities  • Depth. Are well-educated,	<b>program educational objectives:</b> 1. Educate and train MEng graduates with the advanced level academic background and practical engineering experience necessary to function as Computer Science and Engineering	

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	The 1 <sup>st</sup> Program	The 2 <sup>nd</sup> Program	The 3 <sup>rd</sup> Program	The 4 <sup>th</sup> Program	The 5 <sup>th</sup> Program	The 6 <sup>th</sup> Program
<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
	<p>providing solutions to</p> <p>3. interdisciplinary, open-ended, and optimization problems.</p> <p>4. Contribute effectively to the computing profession by fostering effective interaction with colleagues, by using ethical practices and communication skills, and by pursuing further education through lifelong learning.</p> <p>Excel in careers due to the</p>	<p>and gain practical experience.</p> <p>2. To provide a high-quality graduate education in computer science that prepares students for productive careers and lifelong learning.</p> <p>3. To provide a postgraduate level knowledge in computer science, including understanding, analysis, management,</p>	<p>formulate, and solve engineering problems.</p> <p>6. An understanding of professional and ethical responsibility.</p> <p>7. An ability to communicate effectively.</p> <p>8. Recognition of the need for, and an ability to engage in life-long learning.</p> <p>9. A knowledge of contemporary issues.</p> <p>10. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>11. Skills in project management and recognition</p>	<p>highly valued, and successful engineers and scientists</p> <ul style="list-style-type: none"> <li>• Teamwork.</li> </ul> <p>Significantly contribute to technical interdisciplinary team projects</p> <ul style="list-style-type: none"> <li>• Professionalism.</li> </ul> <p>Professionally communicate technical solutions</p>	<p>professionals in a modern, ever-changing world</p> <p>2. Produce graduates who demonstrate competence by being selected for employment by industrial, academic, or government entities, or pursue further professional/graduate studies</p> <p>3. Provide our graduates with the foundation for the development of a</p>	

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<b>Country</b>	<b>Qatar</b>	<b>India</b>	<b>Turkey</b>	<b>US</b>	<b>US</b>	<b>UK</b>
<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
	<p>knowledge received as graduates of the Computing program.</p> <p>6. Meet the changing needs of a knowledge-based economy by adapting and responding to changes in the constantly evolving computing field.</p> <p>7. Prepare themselves for research, teaching and further graduate studies in computing.</p>	<p>and handling of real-life information technology problems in workplace.</p> <p>To provide students with solid foundation in mathematical and computing fundamentals and techniques required to solve related problems and also to pursue higher studies and research.</p> <p>5. To provide the change management in</p>	<p>of international standards and methodologies</p> <p>12. An ability to produce engineering products or prototypes that solve real-life problems.</p> <p>13. Skills that contribute to professional knowledge.</p> <p>14. An ability to make methodological scientific research.</p> <p>15. An ability to produce, report and present an original or</p> <p>known scientific body of knowledge.</p> <p>16. An ability to defend an</p>	<p>and results</p> <ul style="list-style-type: none"> <li>Lifelong Learning. Continue to pursue lifelong multidisciplinary learning as professional engineers and scientists</li> </ul>	<p>successful career and with the understanding that life-long learning is necessary to this development</p> <p>4. Ensure that our graduates understand the broad social, ethical, and professional issues of contemporary engineering practice</p>	

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<b>University</b>	Qatar University	Anna University	ATILIM University	Air Force Institute of Technology	University of Louisville	Imperial College London
		Distance mode through inquiry-based curriculum updating and with use of innovative E-Learning teaching aids. 6. To provide graduate education that will prepare students to become thoughtful, productive members of the computing profession and community.	originally produced idea.			

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ملحق ( 7 ) مؤامة رسالة وأهداف البرنامج مع رؤية ورسالة واهداف الكلية والجامعة

Annex (7) Mapping of mission and objective of the program with vision, mission and objectives of faculty, and university

### Mapping of program vision with Department, faculty, and university vision

University Vision	Faculty Vision	Department vision	Program vision
Sana'a University aspires to achieve a national leading role in teaching, learning, scientific research and community service; and to be among the best regional universities and the foremost house of expertise and think tank in Yemen.	To excel in engineering education & scientific research with distinction at the local and regional levels.		To be distinguished master program for education & scientific research in computer engineering, science and intelligent control locally and regionally.

### Mapping of program mission with Department, faculty and university mission

University Mission	Faculty Mission	Department Mission	Program Mission	M. Sc. Program Mission
To contribute to the sustainable development efforts by providing an accredited higher education environment and excellent research	To provide excellent and accredited engineering education to meet the development needs and match the labor market	Graduate qualified Engineers in Electric Power, communication and computer engineering in accordance with programs committed to the	The Computer and Control Engineering Program mission is to prepare skilled computer and control engineers for successful professional careers	To graduate eminent master engineer in computer engineering & control and field research through a high-qualified academic program,
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### Mapping of program mission with Department, faculty and university mission

University Mission	Faculty Mission	Department Mission	Program Mission	M. Sc. Program Mission
services within a fruitful national partnership based on transparency, professionalism and creativity.	requirements locally and regionally.	international quality standards. The Graduating Engineers handed with enough knowledge and skills necessary to meet the requirements of development as well as local and regional labor markets. Also, they able to self-development and proceed with contemporary issues. The department contribute to community wellness and the country development through scientific research, advisory services, and training and education programs.	at the local and regional levels and to instill in them the desire for life-long learning while emphasizing the role of general education, ethical and social responsibility.	suitable infrastructure and high-qualified staffs, that meet the development requirements as well as local and regional labor markets.

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### Mapping of program objectives with Department, faculty, and university objectives

University Objectives	Faculty Objectives	Department Objectives	Program Objectives	M. Sc. Program Objectives
To provide specialized and in-depth academic opportunities for students in different fields of knowledge to meet the country's needs of specialties, technicians and experts, with special focus on the following:	7. To offer study programs in various fields of knowledge and equip students with required knowledge and scientific and know-how skills to utilize them in resolving problems effectively and efficiently.	Aims of the Department 1. Graduate high qualified engineers in electrical power, communication and computer engineering able to compete at national and regional levels.	<b>The objectives of the program are to provide the graduate students with the ability to fulfill some of the following objectives: -</b> 1. Strong foundation of basic sciences and mathematics and the ability to apply this knowledge to analyze and solve engineering problems.	<b>The objectives of the Master of Science in Computer Engineering and Control program are to provide the post-graduate students with the ability to fulfill some of the following objectives: -</b>  1. To provide specialized studies and encourage fundamental and applied research in different computer engineering and control disciplines.
1. To boost the level and quality of preparation and qualification tasks.	8. To develop positive trends towards engineering science and its accelerating developments and	2. Update undergraduate and post graduate programs and enhance the applied research environment to	<b>2.</b> Broad theoretical as well as practical knowledge related to computer and control engineering specialization.	<b>3.</b> To bridge the gap between the academic educational in university and its industrial and technological environment.
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### Mapping of program objectives with Department, faculty, and university objectives

University Objectives	Faculty Objectives	Department Objectives	Program Objectives	M. Sc. Program Objectives
	enable students to use the techniques and methods of conducting scientific research in engineering fields.	contribute in country development.		
2. To create a general culture aiming at developing the elements of sound Islamic personality and the proper cognitive and scientific training.	9. To develop skills of scientific, innovative and critical thinking as well as the concept of continuous self-education.	4. Establish partnerships with the public and private sectors and provide engineering consultancies, continuous training, teaching and awareness programs.	3. Good communication skills, both orally and in writing, and ability to work effectively individually or as a team member.	4. To deliver graduates with serious scientific and skills letting them excel in their professional life by applying ethical practices and communication skills, sharing innovative and clear ideas and pursuing further education through lifelong learning.
3. To stabilize the true Islamic vision emanating	10. To strengthen scientific ties with national and	5. Improve the academic staff to student ratio as	4. Ability to use computer simulations tools, and software packages to design	5. To produce researchers in computer engineering and control disciplines who can

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### Mapping of program objectives with Department, faculty, and university objectives

University Objectives	Faculty Objectives	Department Objectives	Program Objectives	M. Sc. Program Objectives
from the broad horizons of Islamic knowledge and its perception of the universe, man and life.	international colleges, scientific bodies, and research & development centers.	per standard.	projects or systems to meet specified requirements	pursue further studies and contribute to the scientific research community.
4. To develop innovative and critical scientific thinking skills.	11. To provide technical and specialized studies and consultations to various state bodies and institutions, both public and semi-public, and utilize them in resolving the environment	6. Fill the gap in the number of assistance staff and laboratory technicians and implement training programs to enhance their skills.	5. Ability to use the techniques, skills, and modern tools necessary for computer & control engineering practice.	6. To contribute effectively in adapting and responding that meet the changing needs of a knowledge-based economy and the rapid changing in the evolving computing field.

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### Mapping of program objectives with Department, faculty, and university objectives

University Objectives	Faculty Objectives	Department Objectives	Program Objectives	M. Sc. Program Objectives
	and society issues to promote sustainable development.			
7. To provide students with the required knowledge and scientific and applied skills for solving problems effectively and efficiently.	12. To develop a spirit of co-operation, group work, effective leadership, sense of responsibility, and ethical commitment.	7. Commit and uphold high ethical and professional conduct in the education and practice of engineering.	6. Skills to propose, analyze, validate, interpret, install and maintain computer solutions in real life contexts and a variety of areas of application within an organization.	
			7. An understanding of professional and ethical responsibility, abilities for critical thinking, life-long learning, and updating of	

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### Mapping of program objectives with Department, faculty, and university objectives

University Objectives	Faculty Objectives	Department Objectives	Program Objectives	M. Sc. Program Objectives
			technical knowledge while working as professional engineers.	

ملحق (8) المساقات الرئيسية واوزانها الفرعية لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم

### Appendix (8) Main Themes/Sub-Themes with Relative weight for the Master of Science in Computer Engineering and Control Program.

No.	Themes	Credit Hours	Courses Number	Relative weight for Theme	Sub-Themes
1	Digital Circuits & Systems Design	6	2	14.286%	- Advanced Digital Circuits & Systems Design

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2	Information Technology (IT)	12	4	28.571%	- Advanced Information Technology (IT)
3	Signals & Control Systems	12	4	28.571%	- Advanced Signals & Control Systems
4	Computation & Programming	6	2	14.286%	-
5	Networking & Security	6	2	14.286%	-
<b>Total</b>		<b>42</b>	<b>14</b>	<b>100%</b>	

\* This total is the overall total of both Compulsory and Elective courses.

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ملحق (9) توزيع مخرجات التعلم لبرنامج ماجستير العلوم في هندسة الحاسبات والتحكم مع المساقات الرئيسية  
 Appendix (9) P- ILOs Distribution to Main Themes for Master of Science in Computer engineering and Control program

No	PIL Os	Themes							
		1st Theme	2nd Theme	3rd Theme	4th Theme	5th Theme	6th Theme	7th Theme	8th Theme
1	A1	√	√	√	√				
2	A2	√	√	√		√			
3	A3		√	√	√	√			
4	B1	√	√	√	√	√			
5	B2		√	√		√			
6	B3	√	√	√	√	√			
7	C1	√	√	√	√	√			
8	C2	√	√	√	√	√			
9	C3			√	√				
10	D1	√	√	√	√	√			
11	D2	√		√		√			
12	D3	√	√	√	√	√			

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ملحق (10) موازنة مخرجات تعلم برنامج ماجستير العلوم في هندسة الحاسبات والتحكم مع المقررات

### Appendix (10) Mapping Program Intended Learning Outcomes with courses for Master of Science in Computer Engineering and Control program

Course Name	Program Intended Learning Outcomes (P-IOLs)															
	(A)				(B)				(c)				(D)			
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
Advanced Probability & Statistics	√		√		√		√		√	√			√			
Advanced Embedded Systems Design		√	√		√		√		√		√			√	√	
Advanced Networking		√	√		√		√		√	√				√	√	
Cryptography & Networks Security		√	√			√	√		√	√			√	√		
Advanced Database Management	√	√				√	√		√	√			√		√	
Engineering Applications of Deep Learning	√	√			√	√			√	√			√		√	
Research Methodology																

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Course Name	Program Intended Learning Outcomes (P-IOLs)															
	(A)				(B)				(c)				(D)			
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
Computer Visions and Pattern Recognition	✓	✓			✓		✓		✓	✓			✓		✓	
Advanced Robotics and Intelligent Control Systems		✓	✓		✓		✓		✓		✓		✓	✓	✓	
Advanced Digital Signal Processing	✓	✓			✓	✓				✓	✓		✓		✓	
Systems Modelling & Simulation	✓		✓		✓		✓		✓		✓		✓		✓	
Advanced Computer Architectures	✓	✓			✓		✓			✓			✓		✓	
Advanced Software Engineering		✓	✓			✓	✓		✓	✓			✓		✓	
Big Data & Cloud Computing		✓	✓			✓	✓		✓	✓				✓	✓	
Advanced Project Management																
Advanced Digital System Design	✓	✓			✓		✓		✓	✓			✓	✓		

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Course Name	Program Intended Learning Outcomes (P-IOLs)															
	(A)				(B)				(c)				(D)			
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
THESIS599		√	√		√	√	√		√	√	√		√		√	

ملحق (11) موازنة مخرجات تعلم برنامج ماجستير هندسة الحاسبات والتحكم مع المرجعيات

### Appendix (11) Mapping Program Intended Learning Outcomes with the benchmarks for Master of Science in Computer engineering and Control programs

(IOLs) Intended Learning Outcomes																Standards and Benchmarks
(A)				(B)				(c)				(D)				
A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	
		√				√		√		√		√		√		Master of Science in Computing- Computer Engineering- COLLEGE OF ENGINEERING – Qatar University- QATAR.
	√	√						√	√			√	√	√		COMPUTER SCIENCE AND ENGINEERING - Faculty of Information and Communication Engineering - ANNA UNIVERSITY, CHENNAI- INDIA.
√	√			√	√	√		√	√			√	√	√		Master program of Computer Engineering - School of Engineering - ATILIM University – TURKEY.

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√				√					√		√	√	√	Computer Engineering M.S. - Graduate School of Engineering & Management - Air Force Institute of Technology – USA.
√	√	√			√	√			√	√		√	√	Computer Science and Engineering - Graduate School - University of Louisville – USA.
√	√			√	√			√		√			√	Control Systems - Faculty of Engineering - Imperial College London – U.K.

**ملحق (12) موازنة أهداف البرنامج مع مخرجات التعلم المقصودة لبرنامج ماجستير هندسة الحاسبات والتحكم**  
**Annex-12, Alignment of Computer Engineering and Control Program Objectives with Program Intended Learning Outcomes**

Program Objectives رقم ونص المعيار	Program Intended Learning Outcomes (PILOs) رموز مخرجات التعلم للبرنامج															
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	
<b>Upon successful completion of a Master of Science in Computer Engineering and Control program, postgraduates should be able to:</b>																
1. To provide specialized studies and encourage fundamental and applied research in different	√	√	√				√	√		√	√				√	√
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Program Objectives رقم ونص المعيار	Program Intended Learning Outcomes (PILOs) رموز مخرجات التعلم للبرنامج														
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3
computer engineering and control disciplines.															
2. To bridge the gap between the academic educational in university and its industrial and technological environment.		√	√		√	√	√			√	√		√	√	√
3. To deliver graduates with serious scientific and skills letting them excel in their professional life by applying ethical practices and communication skills, sharing innovative and clear ideas and pursuing further education through lifelong learning.	√	√	√		√	√	√			√	√		√	√	√
4. To produce researchers in computer engineering and control		√	√			√	√			√	√		√	√	√

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Program Objectives رقم ونص المعيار	Program Intended Learning Outcomes (PILOs) رموز مخرجات التعلم للبرنامج														
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3
disciplines who can pursue further studies and contribute to the scientific research community.															
5. To contribute effectively in adapting and responding that meet the changing needs of a knowledge-based economy and the rapid changing in the evolving computing field.		√	√		√	√	√		√	√	√		√	√	√

Head of the Department Adel Al-Shokiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad
Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas			



University of Sana'a  
 Faculty of Engineering  
 Department: Electrical Engineering  
 Title of the Program:  
 Master of Science in Computer Engineering & Control



## Program Specification

### Program Intended Learning Outcomes (PILOs):

#### A. Knowledge and Understanding:

- A.1. Demonstrate deep understanding of computer engineering and control as well as knowledge of applied mathematics and engineering science to the field of computing and intelligent control.
- A.2. Recognize and explain the contemporary engineering technologies and issues in the specialization field of computing and control.
- A.3. Explain in-depth the principles of sustainable design and development of computing products, standards and protocols and intelligent control systems.

#### B. Cognitive/ Intellectual Skills:

- B.1. Evaluate, select and apply appropriate principles, methodologies, techniques, tools and packages to the analysis, specification, development and evaluation of computing and engineering systems.
- B.2. Identify, formulate, analyze and solve research and complex engineering problems.
- B.3. Propose computing system, component, or process to meet desired needs within realistic constraints.

#### C. Practical and Professional Skills:

- C.1. Develop, configure, upgrade, and/or write computer software/program to solve computing and control problems.
- C.2. Use advanced methodology and skills to the formulation and practice of computer science, engineering and control systems.
- C.3. Employ acquired knowledge into a philosophical and intellectual frame that can be applied to computer engineering & control systems and process design and implementation

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## Program Specification

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### D. General and Transferable Skills:

- D.1. Prepare complete thesis and reports, present ideas clearly and defend them.
- D.2. Balance professional and ethical responsibilities including contemporary issues and environmental awareness.
- D.3. Conduct independently and communicate research that advances and extends computing knowledge and scholarship in relate

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