Form no. (13)

Program Specification
for
Computer Engineering Program
According to Curriculum 2014

University:	Pharos University in Alexandria
Faculty:	Faculty of Engineering
Department:	Computer Engineering
Program coordinator:	Prof .DR. Magdi Abdel Azim
Date of adoption:	5/10/2020
Date of approval:	17/8/2021

A-Basic Information:

1.	Program:	Computer Engineering
2.	Program Type:	Single
3.	Department:	Computer Engineering
4.	Adopted Academic standards:	Academic Reference Standards (ARS) for Computer Engineering program that was developed according to the National Academic Reference Standards (NARS Engineering 2018).

Specialized Information:

1. Program Objectives

1.1 Program Mission:

The Computer Engineering Program seeks to graduate a generation of computer engineers capable of continuous learning, and innovation by providing them with a distinguished education that keeps pace with technical developments in the field of Computer Engineering in a way that suits the accelerating needs of the labor market , industry, and encourage critical thinking, entrepreneurship, leadership, conduct scientific research in the field of specialization, judge engineering systems, and provide solutions that suit modern trends in the fields of Computer Engineering, in addition to provide distinguished community services and achieve sustainable development

1.2 Program Aims:

The program of Computer Engineering at Pharos University aims to achieve the academic and technical level necessary for students to keep pace with the steady growth in modern technology in developed societies, and to achieve this, the program aims to prepare the student getting the competencies of engineering graduate as follows:

1. Prepare a graduate capable of applying engineering concepts and skills in data analysis to provide sustainable solutions to societal problems
2. Provide distinguished education that keeps pace with technical developments in the field of computer engineering, commensurate with the accelerating needs of the labor market and environmental service.
3. Prepare a graduate capable of applying scientific thinking and entrepreneurship methods in the computer engineering specialty
4. Provide education that conforms to quality standards to meet the needs of the profession and society and work for sustainable development.
5. Cooperate with foreign educational institutions to disseminate and apply knowledge and exchange experiences in order to serve society and effectively use technology and information systems.
6. Develop research in the field of computer engineering to meet the needs of industry and the local and international community by providing an environment that supports education and scientific research.

1.3 Matching Matrix Between Program Mission and Aims:

Matching Areas	Aims of Computer Engineering Program	Mission of Computer Engineering Program
Education	2-Provide distinguished education that keeps pace with technical developments in the field of computer engineering, commensurate with the accelerating needs of the labor market and environmental service	The Computer Engineering Program seeks to graduate a generation of computer engineers capable of continuous learning, and innovation by providing them with a distinguished education that keeps pace with technical developments in the field of Computer Engineering in a way that suits the accelerating needs of the labor market , industry.
Life-long Learning	1- Develop research in the field of computer engineering to meet the needs of industry and the local and international community by providing an environment that supports education and scientific research	Computer engineers capable of continuous learning,

Matching Areas	Aims of Computer Engineering Program	Mission of Computer Engineering Program
Innovation	2-Provide distinguished education that keeps pace with technical developments in the field of computer engineering, commensurate with the accelerating needs of the labor market and environmental service.	Computer engineers capable of innovation by providing them with a distinguished education that keeps pace with technical developments in the field of Computer Engineering
Partnership with Industry	5-Cooperate with foreign educational institutions to disseminate and apply knowledge and exchange experiences in order to serve society and effectively use technology and information systems.	A serious collaborative methodology with the industry.
Solving Problems	1-Prepare a graduate capable of applying engineering concepts and skills in data analysis to provide sustainable solutions to societal problems	Provide solutions that suit modern trends in the fields of Computer Engineering.
Scientific Research in the Field of Specialization	3- Prepare a graduate capable of applying scientific thinking and entrepreneurship methods in the computer engineering specialty 6-Develop research in the field of computer engineering to meet the needs of industry and the local and international community by providing an environment that supports education and scientific research	Conduct scientific research in the field of specialization.
Sustainability	1-Prepare a graduate capable of applying engineering concepts and skills in data analysis to provide sustainable solutions to societal problems 4-Provide education that conforms to quality standards to meet the needs of the profession and society and work for sustainable development	Provide distinguished community services and achieve sustainable development.
Needs of the Labor Market	2-Provide distinguished education that keeps pace with technical developments in the field of computer engineering, commensurate with the accelerating needs of the labor market and environmental service.	suit the accelerating needs of the labor market , industry, and encourage critical thinking, entrepreneurship, leadership,

Matching Areas	Aims of Computer Engineering Program	Mission of Computer Engineering Program
Initiative and Leadership Skills	1-Prepare a graduate capable of applying engineering concepts and skills in data analysis to provide sustainable solutions to societal problems	suit the accelerating needs of the labor market , industry, and encourage critical thinking, entrepreneurship, leadership,
Community Service and Environmental Development	2-Provide distinguished education that keeps pace with technical developments in the field of computer engineering, commensurate with the accelerating needs of the labor market and environmental service. 4-Provide education that conforms to quality standards to meet the needs of the profession and society and work for sustainable development	Provide distinguished community services
Entrepreneurship	3-Prepare a graduate capable of applying scientific thinking and entrepreneurship methods in the computer engineering specialty 5-Cooperate with foreign educational institutions to disseminate and apply knowledge and exchange experiences in order to serve society and effectively use technology and information systems	A generation capable of entrepreneurship.

2. ARS-Engineering (2018) based Computer Engineering Graduate Competencies

The Computer Engineering program adopts the ARS-Engineering 2018 competency-based specifications of academic requirements. According to NARS-Engineering 2018, the Computer Engineering program structure is divided into:

i. Engineering Graduate Attributes:
   - *The specific qualities that distinguish the graduate engineer.*

ii. General (Generic) Competencies:
   - *General description of the graduate.*
   - *Common competencies that signify all graduates.*
   - *All graduates of any engineering faculty should be able to master.*
   - *These compromise the basis for the development of the programs.*

iii. Specialized (Discipline Specific) Competencies of Electrical Engineers.

iv. Sub-Specialized Competencies of Computer Engineers

2.1 Gap Analysis Between NARS 2009 of Computer Engineering Program and ARS (According to NARS 2018) of Computer Engineering:

In order to analyze the gap between the NARS 2009 of Computer Engineering and ARS (according to NARS 2018) of the Computer Engineering program, the following steps have been performed:

1- **Preparing gap analysis matrix between Intended Learning Outcomes (ILOs) of NARS 2009 and competencies of ARS (according to NARS 2018).**
2- **Preparing gap analysis matrix between graduate attributes NARS 2009 and graduate attributes of NARS 2018.**
3- **Examining the matching matrices, which revealed that some competencies of ARS (according to NARS 2018) were not covered in the ILOs of NARS 2009. Accordingly, an action plan was proposed to achieve those competencies and overcome the gap.**

2.2. The Engineering Graduate must:

According to the NARS-Engineering 2018; the graduates of the engineering programs should be able to satisfy the attributes listed below:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

7. Use techniques, skills and modern engineering tools necessary for engineering practice.
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

2.2.1 Matching Matrix Between Graduate Attributes and Program Aims:

Aims of the Program	Graduate Attributes
1.Prepare a graduate capable of applying engineering concepts and skills in data analysis to provide sustainable solutions to societal problems	1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
	7. Use techniques, skills and modern engineering tools necessary for engineering practice
	9-Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner
2.Provide distinguished education that keeps pace with technical developments in the field of computer engineering, commensurate with the accelerating needs of the labor market and environmental service.	1. Behave professionally and adhere to engineering ethics and standards.
	7. Use techniques, skills and modern engineering tools necessary for engineering practice.
3.Prepare a graduate capable of applying scientific thinking and entrepreneurship methods in the computer engineering specialty	2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

	6.Value the importance of the environment, both physical and natural, and work to promote sustainability principles
	10.Demonstrate leadership qualities, business administration and entrepreneurial skills
4.Provide education that conforms to quality standards to meet the needs of the profession and society and work for sustainable development.	4.Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
	5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community
	8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
5.Cooperate with foreign educational institutions to disseminate and apply knowledge and exchange experiences in order to serve society and effectively use technology and information systems.	3. Behave professionally and adhere to engineering ethics and standards
	5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
	8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies

6.Develop research in the field of computer engineering to meet the needs of industry and the local and international community by providing an environment that supports education and scientific research.	8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies
	5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

2.2.2 Computer Engineering graduates career prospects:

The graduate from this major will be qualified to work in:

- A Network Administrator is responsible for supporting, configuring, and maintaining corporate customer networks and in-house servers. They install and integrate new server hardware and applications, and continually monitor for necessary updates, ensuring optimal network performance and security.
- Software developers design, program, build, deploy and maintain software using many different skills and tools.
- Software testing is a crucial activity in the software development life cycle that aims to evaluate and improve the quality of software products. Thorough testing is essential to ensure software systems function correctly, are secure, meet stakeholders' needs, and ultimately provide value to end users.
- Database Administrator (DBA) ensures that data is correctly stored and retrieved. In addition, DBAs often work with developers to design and implement new features and troubleshoot any issues.
- A Full-Stack developer is a professional responsible for working on both front-end and back-end development processes. They design, develop, and maintain fully-fledged and functioning platforms with databases or servers.
- A mobile application developer uses programming languages and development skills to create, test, and develop applications on mobile devices. They work in popular operating system environments like iOS and Android and often take into account UI and UX principles when creating applications.
- IoT developer is responsible for designing and developing the software and hardware that powers IoT devices and systems.

- A Machine Learning (ML) developer is an expert on using data to training models. The models are then used to automate processes like image classification, speech recognition, and market forecasting.

2.2.3 Interaction of the Computer Engineering program with the needs of the labor market:

One of the main objectives of the program is the continuous interaction with the needs of the labor market, since that market is the real consumer of the program's output. In line with the total quality system, the program outputs must comply with the requirements of the consumer, and accordingly, the university is committed to communicating with the chambers of commerce and industry, which are representative of the industrial community, to identify the real needs of graduates from the program.

Pharos University in Alexandria has signed a cooperation agreement with the Royal Swedish Institute for Engineering Technology (PUA/KTH Activity Agreement) with the aim of developing modern methods of learning and modifying the contents of academic courses in line with modern trends of engineering education systems in advanced industrial countries. It has also been considered as an international reference for various programs. It was mentioned and approved by the Supreme Council of Private Universities for a partnership agreement with the Royal Swedish Institute of Engineering Technology (KTH) to implement Swedish education quality standards and to grant the student a certificate stating that the bachelor's degree granted by Pharos University matches its counterpart granted by the Royal Swedish Institute.

2.3. General Engineering (Level-A) Competencies:

According to the NARS-Engineering 2018; the graduates of the Engineering Programs should be able to satisfy the General Competencies (Level-A) as follows:

A.1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A.2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A.3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A.4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
A.5. Practice research techniques and methods of investigation as an inherent part of learning.
A.6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
A.7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
A.8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
A.9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
A.10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

2.4. Computer Engineering (Level-B) Competencies:

According to the rules of the modified NARS-Engineering 2018 in addition to the General Engineering Competencies. The graduate of the Computer Engineering Programs should be able to satisfy the specialized (discipline specific) competencies for Basic Electrical Engineering listed as follow

B.1. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
B.2. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
B.3. Design and implement: elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.
B.4. Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.
B.5. Adapt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

2.5. Computer Engineering (Level-C) Competencies:

And according to Academic Reference Standers (ARS) for Computer Engineering program at Pharos University; the graduates should be able to satisfy the sub –specialized competencies of the computer Engineering program (Level-C) listed as follow:

C.1 Design, implement, test a complete computer system including function specifications, requirements, and performance

C.2 Understanding basic and theoretical foundation of Computer science including Algorithms, Programming and Data Bases.

C.3 Illustrate the technology necessary to build analogue and digital systems, automatic control systems and demonstrate the basic building blocks and organization of the computer including microprocessor

C.4 Use appropriate specialized software packages, write computer programs, use relevant laboratory equipment for the analysis and design of systems, Design, Select, and apply Artificial Intelligence based solutions

3. Relation between National Academic Reference Standards (NARS-2018) Competencies and Academic Reference Standards (ARS) Computer Engineering Program Competencies:

Level	NARS-2018 Competencies	ARS for Computer Engineering Program	
		Program Competencies	Sub-Competencies for Courses
Level-A (General Engineering)	1	A.1	**A.1.1** Solve engineering problems using engineering basic science.
			A.1.2 Formulate engineering problems using engineering fundamentals and basic science.
			A.1.3 Apply engineering fundamentals, basic science and mathematics.
			A.1.4 Identify complex engineering problems.
	2	A.2	**A.2.1** Develop and conduct appropriate experimentation and evaluate findings.
			A.2.2 Develop and conduct simulation.
			A.2.3 Interpret data, assess and evaluate findings.
			A.2.4 Use statistical analyses and objective engineering judgment to draw conclusions.
	3	A.3	**A.3.1** Develop engineering design processes.
			A.3.2 Formulate cost effect solutions.
			A.3.3 Make use of global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline.

Level	NARS-2018 Competencies	ARS for Computer Engineering Program	
		Program Competencies	Sub-Competencies for Courses
			A.3.4 Apply sustainable design and development.
	4	**A.4**	**A.4.1** Utilize Contemporary technologies to solve engineering problems.
			A.4.2 Apply codes of practice and standards.
			A.4.3 Apply quality guidelines, health and safety requirements as well as environmental issues.
			A.4.4 Apply risk management principles.
	5	**A.5**	**A.5** Practice research techniques and methods of investigation as an inherent part of learning.
	6	**A.6**	**A.6.1** Plan engineering projects, taking into consideration other disciplines requirements.
			A.6.2 Supervise and monitor implementation of engineering projects, taking into consideration other disciplines requirements.
	7	**A.7**	**A.7.1** Function efficiently as an individual member.
			A.7.2 Function efficiently as a member of multi-disciplinary and multicultural teams.
	8	**A.8**	**A.8.1** Communicate graphically in an effective manner with a range of audience using contemporary tools.
			A.8.2 Communicate effectively in verbal and in writing ways with a range of audience using contemporary tools.
	9	**A.9**	**A.9.1** Propose creative, innovative and flexible thinking to anticipate and respond to new situations.
			A.9.2 Adapt entrepreneurial and leadership skills to anticipate and respond to new situations.
	10	**A.10**	**A.10.1** Acquire and apply new knowledge.
			A.10.2 Apply practice self, lifelong and other learning strategies.
Level-B (Electrical)	**5.1**	**B.1**	**B.1.1.** Select electrical systems applicable to generation, transmission and distribution of electrical systems.
			B.1.2. Model electrical systems with analysis applicable to generation, transmission of electrical systems.

Level	NARS-2018 Competencies	ARS for Computer Engineering Program	
		Program Competencies	Sub-Competencies for Courses
			B.1.3. Analyze generation, transmission of electrical systems.
	5.2	**B.2**	**B.2.1. Design electronic, digital and computer systems with analysis for specific application**
			B.2.2. Model electronic ,digital and computer systems with analysis for specific application
			B.2.3. Analyze and Implement electronic ,digital and computer systems with analysis for specific application
	5.3	**B.3**	**B.3.1. Design element ,modules, digital and computer systems using technological and professional tools.**
			B.3.2. Implement digital systems and computer systems with technological and professional tools.
			B.3.3. Integrate electrical, electronic and digital elements, modules, sub-systems or systems in creatively electrical computer-controlled systems
	5.4	**B.4**	**B.4.1. Assess the performance of electronic, digital and computer systems under specific input excitation and its suitability for specific application.**
			B.4.2. Measure and estimate the performance of electronic, digital and computer systems under specific input excitation and its suitability for specific application
	5.5	**B.5**	**B.5.1. Adapt suitable codes to design ,build ,operate, inspect systems and services.**
			B.5.2. Employ codes to design ,build ,operate, inspect systems and services
			B.5.3. Apply codes to design, build, operate, inspect systems and services.

Level	NARS-2018 Competencies	ARS for Computer Engineering Program	
		Program Competencies	Sub-Competencies for Courses
Level-C (Computer Engineering)		C.1	C.1.1 Design a complete computer system including function specifications, requirements,
			C.1.2 Implement a complete computer system including function specifications, requirements,
			C.1.3 Test the performance a complete computer system including function specifications, requirements
		C.2	C.2.1 Explain basic and theoretical foundation of Computer science including Algorithms,
			C.2.2 Explain basic and theoretical foundation of Computer science including Programming and Data Bases
		C.3	C.3.1 Illustrate the technology necessary to build analogue and digital systems, automatic control systems
			C.3.2 Show the basic building blocks and organization of the computer including microprocessor.
		C.4	C.4.1 Use appropriate specialized software packages and computer programing for the analysis and design of systems.
			C.4.2 Use relevant laboratory equipment for the analysis and design of systems.
			C.4.3 Design appropriate Artificial Intelligence solutions
			C4.4 select and apply appropriate Artificial Intelligence solutions
			C.4.5 implement Artificial Intelligence based solutions

3.1 Matching Matrix Between Aims and Competencies of the Program

Aim of program	Competencies of the Computer Engineering Program																		
	A.1	A.2	A.3	A.4	A.5	A.6	A.7	A.8	A.9	A.10	B.1	B.2	B.3	B.4	B.5	C.1	C.2	C.3	C.4
Aim 1	■		■							■		■	■	■			■	■	
Aim 2		■		■					■		■	■	■	■		■		■	■
Aim 3		■		■	■			■	■	■	■	■	■	■		■		■	■
Aim 4						■	■		■					■	■				■
Aim 5			■			■	■	■							■				
Aim 6			■	■	■				■			■		■		■			■

3.2 Matching Matrix Between Graduate Attributes and Competencies of the Program:

Graduate Attributes	Competencies of the Computer Engineering Program																		
	A.1	A.2	A.3	A.4	A.5	A.6	A.7	A.8	A.9	A.10	B.1	B.2	B.3	B.4	B.5	C.1	C.2	C.3	C.4
1	■	■	■			■				■	■			■	■	■	■	■	■
2	■	■							■		■	■		■		■			■
3			■	■					■						■				
4							■	■	■										
5			■			■													
6			■	■															■
7				■	■	■			■	■		■	■		■	■		■	■
8					■					■									
9					■			■	■	■									
10						■	■	■	■	■									

3.3 Academic Standards of Program Specifications:

- The faculty adopts the Academic Standards of the National Authority for Quality Assurance and Accreditation of Education (NAQAAE).
- Comparative study between Competency-Based NARS 2018 and Computer Engineering program graduate attributes is available as attached extension.
- Competency-Based NARS 2018 was previously discussed and adopted in the department council on 5/10/2020.
- Competency-Based NARS 2018 was adopted in a faculty council on 16/11/2020.
- Program matrix; program courses vs sub-competencies, was prepared.
- Updating teaching and learning strategy and assessment methods to be in line with Competency-Based NARS 2018, was a major activity done by engineering QAU.
- Workshops were carried out to train and increase the awareness of staff members about Competency-Based NARS 2018 and the updated teaching and learning strategy and assessment methods.
- All previous documents are available as external extension.

4. External References for Standards (Benchmarks)

Continuous follow-up of the Royal Institute of Technology in Sweden (KTH) team within the activities of the PUA / KTH agreement to accredit the bachelor's degree granted by the Computer Engineering Program at the Faculty of Engineering, Pharos University in Alexandria, according to the Swedish educational quality standards. Periodic visits and meetings twice per academic year are held between the KTH team, the head of department and staff. The follow-up reports include reviewing of semester's final examinations, statistics and graduation projects' thesis and presentations to ensure that the program is doing several improvements to reach a high-quality education.

5. Program Structure and Contents

Program general framework refers to the graduation requirements, Credit Hours distribution for PUA requirements, Computer Engineering department requirements. It includes courses and their relevance to the intended Competencies outcomes.

5.1 Features of the Education System:

- Faculty of Engineering offers Bachelor's degree in engineering science using Credit Hours system.
- One credit hour is equivalent to one lecture hour or 2 to 3 tutorial/practical hours for all offered courses.
- The academic rules and regulations are subjected to the NARS-Engineering (2018).
- Education system using English language and it may teach some courses using Arabic language according to a decision from the University Supreme Council.

5.2 Credit Hour System:

A student in the Computer program must successfully pass courses totaling a minimum of 177 credit hours, through at least five academic years of study (or 10 academic semesters). The credit hours for compulsory courses and elective courses are distributed as:

Elective = 20 Cr **Compulsory = 157 Cr** **Total = 177 Cr**

Table 1 shows the distribution of the total credit hours.

Table 1 Credit Hours Distribution for Computer Engineering Department

Credit hours graduation requirements			Total
University Requirements	Compulsory	14	14
Faculty Requirements	Compulsory	31	35
	Elective (Humanities Courses)	4	
Department Requirements	Compulsory	55	112
Specialization Requirements		57	
Specialized Required Elective Courses		16	16
Total Credit Hours Requirements for Graduation			**177**

An academic degree is awarded to undergraduate students who fulfil the overall following requirements:

i) Achievement of CGPA of 2.00 or higher.
ii) Correction of any failing grade(s) (F, BL, NE, or DN) for required courses (if any), and passing the minimum number of specified elective courses (N.B. a student is allowed to graduate with pass conditional grade (C-, D+, or D) in one or more courses provided that the CGPA is 2.00 or above).
iii) Completion of the minimum number of credit hours required for graduation (177 Cr).
iv) Passing successfully the graduation project courses.
v) Fulfillment of the training field requirements: 60 days scheduled in three (or more) summer vacation.
vi) Fulfillment of the above-mentioned requirements within five years (or ten academic semesters). Student may graduate, if he/she fulfilled the graduation requirements six months before the complete study period.
vii) Fulfillment of any other requirements in the faculty academic rules and regulations.

5.3 Program Course Level

The total of 177 credit hours are distributed among the ten semesters of the five academic years as listed in Table 2.

Table 2 Credit Hours Distribution among Semesters of Academic Years

Academic Year	Semester	Number of Credit Hours required to Pass			
		Compulsory	Elective	University requirements	Total
First	1	15	0	4	19
	2	14	0	4	18
Second	3	18	0	0	18
	4	14	2	2	18
Third	5	17	2	0	19
	6	16	0	2	18
Fourth	7	18	0	0	18
	8	15	0	2	17
Fifth	9	8	8	0	16
	10	8	8	0	16

5.4 University Requirement Courses:

The university requirements include 14 credit hours of different courses as indicated in the Table 3.

Table 3 University Requirement Courses

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
UGE 01	English Language (1)	2	None	1	0	2	2						
UGE 02	English Language (2)	2	UGE 01	1	0	2	2						
UGE 03	English Language (3)	2	UGE 02	1	0	2	2						
UEC 01	Computer Skills & Programming Concepts (1)	2	None	1	1	2					2		
UEC 02E	Computer Skills & Programming Concepts (2)	2	UEC 01	1	1	2					2		
UC 01	Communications Skills	2	None	2	0	0	1						
UGA 03	Arabic Language Skills	2	None	2	0	0	2						
Total Credit hours		**14**	**Total Contact Hours**	**9**	**2**	**10**							
				21									

5.5 Basic Science Faculty Requirements Courses:

The faculty requirements include 31 credit hours of different basic science courses that are distributed as indicated in the Table 4.

Table 4 Basic Science Faculty Requirements Courses

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
EB 101	Engineering Mathematics (1)	3	None	2	2	1		3					
EB 102	Engineering Mathematics (2)	3	EB 101	2	2	1		3					
EB 111	Engineering Mechanics (1)	3	None	3	1	0		3					

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
EB 112	Engineering Mechanics (2)	3	EB 111	3	1	0		3					
EB 121	Engineering Physics (1)	3	None	2	1	2		3					
EB 122	Engineering Physics (2)	3	EB 121	2	1	2		3					
EB 131	General Chemistry	2	None	1	1	2		2					
EB 141	Eng. Drawing & Descriptive Geometry (1)	3	None	2	3	0			3				
EB 142	Eng. Drawing & Descriptive Geometry (2)	2	EB 141	1	2	1			2				
EM 170	Introduction to Manufacturing Processes	2	None	1	1	2			1			1	
HU 113	Technical Reports Writing and Presentation Skills	2	None	1	0	2	2						
HU 121	Engineering Perspectives and Technology	2	None	1	0	2	2						
Total Credit hours		**31**	**Total Contact Hours**	**21**	**15**	**15**	4	20	6	0	0	1	0
				51									

5.6 Humanities Elective Faculty Requirements Courses:

Students should select 4 credit hours from the listed humanities and social sciences courses listed in Table 5.

Table 5 Available HU Elective Courses

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
HU 131	Project Management	2	None	2	1	0	2						
HU 132	Accounting and Costs for Engineers	2	None	2	1	0	2						
HU 133	Engineering Statistics	2	None	2	1	0	2						
HU 134	Engineering Economy	2	None	2	1	0	2						
HU 135	Sales, Marketing and Communication Techniques	2	None	2	1	0	2						
HU 141	Ethics & Human Rights	2	None	2	0	0	2						
HU 142	Legislations and Contracts	2	None	2	1	0	2						
HU 143	Principles of Law	2	None	2	0	0	2						
HU 144	Communications Laws and Rules	2	None	2	0	0	2						
HU 151	Industrial Safety	2	None	2	0	0	2						
HU 161	Environment and Society	2	None	2	0	0	2						
HU 162	Human Computer Interaction	2	None	1	0	2	2						
HU 170	Risk Management	2	None	2	0	0	2						
Total Credit hours		**26**	**Total Contact Hours**	**25**	**6**	**2**	**26**	**0**	**0**	**0**	**0**	**0**	**0**
				33									

5.7 Computer Engineering Department Requirements:

The Computer Engineering department requirements include 157 credit hours of different compulsory courses as detailed in the Table 1.

Table 6 Computer Engineering Department Requirement Courses: Basic science courses

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Class work	lab	Project and IT	Oral /work shop	Final written exam	Total	Time of exam
EB 103	Engineering Mathematics (3)	3	EB 102	2	2	1	40	0	10	0	50	100	3
EB 104	Linear Algebra	3	EB 102	2	2	1	40	0	10	0	50	100	3
EB 123	Modern Physics	3	EB 122	2	2	1	50	0	0	0	50	100	3
EB 204	Engineering Mathematic (4)	3	EB 103	2	2	1	40	0	10	0	50	100	3
EB 208	Applied probability and statistics	3	EB 204	3	1	0	50	0	0	0	50	100	3
EB 207	Numerical Analysis using MATLAB	4	EB 102	3	1	2	40	0	10	0	50	100	3
EC171	Discrete mathematics	4	EB102	3	2	0	40	0	10	0	50	100	3
Total Credit hours		**23**	**Total Contact Hours**	**17**	**12**	**6**							
				35									

Table 7 Computer Engineering Department Requirement Courses: Engineering sciences courses

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Class work	lab	Project and IT	Oral /work shop	Final written exam	Total	Time of exam
EE 291	Electric circuits	4	EB 102& EB 122	3	2	1	40	0	10	0	50	100	3
EE 232	Electronics	3	EE 291	2	2	1	40	0	10	0	50	100	3
EE 241	Signal and systems	3	EB 204	2	2	1	50	0	0	0	50	100	3
EE 290	Control system (1)	3	EB 204 &EE 291	2	2	1	40	0	10	0	50	100	3

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Class work	lab	Project and IT	Oral /work shop	Final written exam	Total	Time of exam
EC 121	Introduction to digital logic design	4	UEC 01	3	1	2	50	0	5	0	50	100	3
EC 222	Advanced digital logic design	4	EC 121	3	1	2	40	0	5	0	50	100	3
EC 281	Microprocessors and assembly language	4	EC 222	3	1	2	40	0	5	0	50	100	3
EC 361	Data and computer communications	3	EB 208& EE 241	2	2	1	40	0	5	0	50	100	3
EC 363	Computer networks	4	EC 361	3	2	1	40	0	0	0	50	100	3
Total Credit hours		**32**	**Total Contact Hours**	**23**	15	12							
				50									

5.8 Specialization Requirements for Computer Engineering Program:

The Computer Engineering Program requirements include at least 73 credit hours of specialized courses; which are distributed as follows:

- 57 credit hours of compulsory courses (as shown in Table 8).
- 16 credit hours of elective courses (as shown in Table 9).

Table 8 Required Compulsory Courses for Computer Engineering Specialization

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Distribution of grades						
				Lecture	Tutorial	Practical	Class work	lab	Project and IT	Oral /work shop	Final written exam	Total	Time of exam
EC 132	Structured programing	4	UEC 02E	3	1	2	40	5	5	0	50	100	3
EC 233	Data structures and algorithms	4	EC 132& EC 171	3	1	2	40	5	5	0	50	100	3
EC 234	Object oriented programming	4	EC 132	3	1	2	40	5	5	0	50	100	3

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Distribution of grades						
				Lecture	Tutorial	Practical	Class work	lab	Project and IT	Oral /work shop	Final written exam	Total	Time of exam
EC 235	Advanced algorithms	3	EC 233	2	2	1	40	5	5	0	50	100	3
EC 241	Systems programming	3	EC 132	2	2	1	40	5	5	0	50	100	3
EC 271	Computer organization	3	EC 222	2	2	1	40	5	5	0	50	100	3
EC 292	Concurrent programming	3	EC 234	2	2	1	40	5	5	0	50	100	3
EC 312	Embedded systems	3	EC 281	2	1	2	40	5	5	0	50	100	3
EC 342	Operating systems	3	EC 271& EC 241	2	2	1	40	5	5	0	50	100	3
EC 351	Database management systems	3	EC 235 &EC 234	2	1	2	40	5	5	0	50	100	3
EC 352	Software Engineering	3	EC 351	2	2	1	40	5	5	0	50	100	3
EC 359	Programming languages &translators	3	EC 241& EC 171	2	2	1	40	5	5	0	50	100	3
EC 365	Computer security	3	EC 361& EC 342	2	2	1	40	5	5	0	50	100	3
EC 372	Computational models	2	EC 235	2	1	0	40	5	5	0	50	100	2
EC 383	Intelligent systems	3	EC 235& EC 234	2	1	2	40	5	5	0	50	100	3
EC 400-1	Graduating project(1)	5	Department approval atb9th semester	3	0	6	20	0	0	0	0	100	3
EC 400-2	Graduating project(2)	5	EC 400-1	3	0	6	20	0	30	30	0	100	-

Table 9 Required Elective Courses Computer Engineering Specialization *(Select 16 Cr Hours)*

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Distribution of grades						
				Lecture	Tutorial	Practical	Class work	lab	Project and IT	Oral /work shop	Final written exam	Total	Time of exam
EC 373	Distributed Systems & Web Services	3	EC 342, EC 361	2	1	2	40	5	5	0	50	100	3
EC 381	Computer Graphics and Visualization	3	EC 234, EB 204, EC 233	2	1	2	40	5	5	0	50	100	3
EC 385	E-business	2	EC 234	1	1	2	40	5	5	0	50	100	2
EC 386	Multimedia Systems	3	, EC 361, EC 234	2	1	2	40	5	5	0	50	100	3
EC 387	Decision Support Systems	2	EC 351	1	1	2	40	5	5	0	50	100	2
EE 346	Introduction to computer vision	3	EE 241	2	2	1	40	10	0	0	50	100	3
EC 384	Modeling and Simulation	2	EC 233, EB 208	1	1	2	40	5	5	0	50	100	2
EC 343	Workflow management	3	EC 233, EC 234	2	1	2	40	5	5	0	50	100	3
EC 395	Image processing	3	EE 241	2	1	2	40	5	5	0	50	100	3
EC 313	Computer architecture	3	EC 271	2	1	2	40	5	5	0	50	100	3
EC 362	Digital signal processing	3	EE 241	2	1	2	40	10	0	0	50	100	3
EC 382	Introduction to Biomedical Engineering	2	EC 235, EE 232	1	1	2	40	5	5	0	50	100	2
EC 388	Introduction to Mechatronics	3	EE 290, EC 312, EB 112	2	1	2	40	10	0	0	50	100	3
EE 391	Digital Control Systems	3	EE 290	2	2	1	40	10	0	0	50	100	3
EE 326	Introduction to Robotics	3	EE 290	2	2	1	40	5	5	0	50	100	3
EC 397	Advanced computer architecture and parallel processing	3	EC313	2	1	2	40	5	5	0	50	100	3
Total Credit hours		16											

5.9 Computer Engineering Program Courses Mapping to Subject Categories of NARS

A student graduates from the program of Computer Engineering when he/she accumulates at least 177 credits according to curricula contents of the Computer Engineering Program. Table 10 illustrates the classifications of the indicative curricula contents of the Computer Engineering Program according to subject areas (or topics) of NARS requirements. And Table 10 illustrates the distribution of different subject areas among the 10 semesters.

Table 10 Indicative Curriculum Content of Computer Engineering Program according to NARS

NARS ID Letter	Topic (or Subject Area)	Program Credit Hours			NARS Requirements
		Compulsory	Elective	Percentage	
A	Humanities and Social Sciences	14 Cr	4 Cr	**10.17%**	9 – 12%
B	Mathematics and Basic Sciences	37 Cr	None	**20.9%**	20 – 26%
C	Basic Engineering	37 Cr	None	**20.9%**	20 – 23%
D	Applied Engineering and Design	36 Cr	None	**20.34**	20 – 22%
E	Computer Applications and ICT	19 Cr	None	**10. 73%**	9 – 11%
F	Projects and Practice	14 Cr	2 Cr	**9.0%**	8 – 10%
G	Discretionary (Institution character-identifying) Subjects	None	14 Cr	**7.91%**	6 – 8%

Table 11 Distribution of different subject areas among the 10 semesters

Semester	Credit	Subject Area						
		Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
1st	18	4	9	3	0	2	0	0
2nd	19	2	9	6	0	2	0	0
3rd	18	0	6	8	0	4	0	0
4th	18	4	10	0	0	4	0	0
5th	19	2	0	6	7	0	4	0
6th	18	2	3	0	6	7	0	0
7th	18	2	0	10	6	0	0	0
8th	17	2	0	4	11	0	0	0
9th	16	0	0	0	3	0	7	6
10th	16	0	0	0	3	0	5	8
Program in Cr	177	**18**	**37**	**37**	**36**	**19**	**16**	**14**
Program in Per	100.00%	10.17%	20.90%	20.90%	20.34%	10. 73%	9.04%	7.91%
NARS In Per		9 - 12%	20 - 26 %	20 - 26 %	20 - 22 %	9 - 11 %	8 - 10 %	6 - 8 %

5.10 Study plan for Computer Engineering Program:

Tables 12 to 22 show the suggested study plans during the five academic years of study starting from First Year up to the Fifth Year (or Academic Semesters 1 to 10) for the Computer Engineering program.

Faculty Study Plan
First Level

1st Year (Semester-1)

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
EB 101	Engineering Mathematics (1)	3	None	2	2	1		3					
EB 111	Engineering Mechanics (1)	3	None	3	1	0		3					
EB 121	Engineering Physics (1)	3	None	2	1	2		3					
EB 141	Eng. Drawing & Descriptive Geometry (1)	3	None	2	3	0			3				
UEC 01	Computer Skills & Programming Concepts (1)	2	None	1	1	2					2		
HU 121	Engineering Perspectives and Technology	2	None	1	0	2	2						
UEG 01	English Language (1)	2	None	1	0	2	2						
Total Credit hours		**18**	**Total Contact Hours**	**12**	**8**	**9**	**4**	**9**	**3**	**0**	**2**	**0**	**0**
				30									

1st Year(Semester-2)

Course Code	Course Name	Credit hours	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied Engineering	Comp. App & IT	Project & Practice	Discretionary
EB 102	Engineering Mathematics (2)	3	EB 101	2	2	1		3					
EB 112	Engineering Mechanics (2)	3	EB 111	3	1	0		3					
EB 122	Engineering Physics (2)	3	EB 121	2	1	2		3					
EB 142	Eng. Drawing & Descriptive Geometry (2)	2	EB 141	1	2	1			2				
EB 131	General Chemistry	2	None	1	1	2			2				
UEC 02E	Computer Skills & Programming Concepts (2)	2	UEC 01	1	1	2					2		
UGE 02	English Language (2)	2	UGE 01	1	0	2	2						
EM 170	Introduction to Manufacturing Processes	2	None	1	1	2			2			0	
Total Credit hours		**19**	**Total Contact Hours**	**12**	**9**	**12**	**2**	**9**	**6**	**0**	**2**	**0**	**0**
				31									

2nd Year (Semester-3)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EB 103	Engineering Mathematics (3)	3	EB102	2	2	1		3					
EB 123	Modern physics	3	EB122	2	2	1		3					
EE 291	Electric Circuits	4	EB102& EB122	3	2	1			4				
EC 121	Introduction to Digital Logic Design	4	UEC 01	3	1	2			4				
EC 132	Structured Programming	4	UEC 02E	3	1	2					4		
	TOTAL	**18**		**13**	**8**	**7**	**0**	**6**	**8**	**0**	**4**	**0**	**0**

2nd Year (Semester-4)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EC 171	Discrete Mathematic	4	EB 102	3	2	0		4					
EB 104	Linear Algebra	3	EB 102	2	2	1		3					
EB 204	Engineering Mathematic (4)	3	EB 103	2	2	1		3					
UGE 03	English Language (3)	2	UGE 02	1	0	2	2						
EC 222	Advanced Digital Logic Design	4	EC 121	3	1	2					4		
HU Elective	Humanity Elective	2	None	2	1	0	2						
	TOTAL	**18**		**13**	**8**	**6**	**4**	**10**	**0**	**0**	**4**	**0**	**0**

3rd Year (Semester-5)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EE 232	Electronics	3	EE 291	2	2	1			3				
EE 241	Signals and systems	3	EB 204	2	2	1			3				
EC 207	Numerical Analysis using MATLAB	4	EB 102	3	1	2						4	
EC 233	Data Structures and Algorithms	4	EC 132& EC 171	3	1	2				4			
EC 241	Systems Programming	3	EC 132	2	2	1				3			
HU Elective	Humanity Elective	2	None	1	0	2	2						
	TOTAL	**19**		**13**	**8**	**9**	**2**	**0**	**6**	**7**	**0**	**4**	**0**

3rd Year (Semester-6)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EB 208	Applied Probability and Statistics	3	EB 204	3	1	0		3					
EC 235	Advanced Algorithms	3	EC 233	2	2	1				3			
EC 271	Computer Organization	3	EC 271	2	2	1				3			
EC 292	Concurrent Programming	3	EC 234	2	2	1					3		
UGA 03	Arabic Language Skills	2	None	2	0	0	2						
EC 234	Object Oriented Programming	4	EC 132	3	1	2					4		
	TOTAL	**18**		**14**	**8**	**5**	**2**	**3**	**0**	**6**	**7**	**0**	**0**

4th Year (Semester-7)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math &	Basic	Applied	Comp. App	Project &	Discretionar
EE 290	Control system (1)	3	EB 204 & EE 291	2	2	1			3				
EC 351	Database Management Systems	3	EC 235 & EC 234	2	1	2				3			
EC 281	Microprocessors and assembly language	4	EC 222	3	1	2			4				
EC 342	Operating Systems	3	EC 271 & EC 241	2	2	1				3			
EC 361	Data and Computer Communications	3	EB 208 & EE 241	2	2	1			3				
HU 113	Technical Reports Writing and Presentation Skills	2	UGE 02	1	0	2	2						
	TOTAL	**18**		**12**	**8**	**9**	**2**	**0**	**10**	**6**	**0**	**0**	**0**

4th Year (Semester-8)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EC 312	Embedded Systems	3	EC 281	2	1	2				3			
EC 363	Computer Networks	4	EC 361	3	2	1			4				
EC 365	Computer Security	3	EC 361 & EC 342	2	2	1				3			
EC 359	Programming Languages & Translators	3	EC 241 & EC 171	2	2	1				3			
EC 372	Computational Models	2	EC 235	2	1	0				2			
UC-01	Communication skills	2	None	2	0	0	2						
	TOTAL	**17**		**13**	**8**	**5**	**2**	**0**	**4**	**11**	**0**	**0**	**0**

5th Year (Semester-9)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EC 352	Software Engineering	3	EC 351	2	2	1				3			
EC Elective	Computer Elective Course from table 9	3	-	2	1	2							3
EC 400-1	Graduating Project (1)	5	Department approval at 9th semester	3	0	6						5	
EC Elective	Computer Elective Course from table 9	3	-	2	1	2							3
EC Elective	Computer Elective Course from table 9	2	-	1	1	2						2	
	TOTAL	**16**		**10**	**5**	**13**	**0**	**0**	**0**	**3**	**0**	**7**	**6**

5th Year (Semester-10)

Code	Course Title	Credit	Pre-requisites	Teaching			Subject Area						
				Lecture	Tutorial	Practical	Hum & Soc	Math & Basic	Basic Engineering	Applied	Comp. App & IT	Project & Practice	Discretionary
EC 383	Intelligent Systems	3	EC 235 & EC 234	2	1	2				3			
EC 400-2	Graduating Project (2)	5	EC 400-1	3	0	6						5	
EC Elective	Computer Elective Course from table 9	3	--	2	1	2							3
EC Elective	Computer Elective Course From table 9	3	-	2	1	2							3
EC Elective	Computer Elective Course From table 9	2	-	1	1	2							2
	TOTAL	**16**		**10**	**4**	**14**	**0**	**0**	**0**	**3**	**0**	**5**	**8**

6. Program Courses Contents

6.1 University Requirement Courses:

Course Code	UGE 01	Contact Hours/Week			
Course Name	English Language (1)				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	0	2	3

Course Description:

This course aims to consolidate the English language skills the students acquired during their primary and secondary education. The course focuses on honing the students' Speaking, Writing, Reading and Listening abilities. These objectives are realized by providing the students with a curriculum that is commensurate with the scientific studies they have chosen to pursue. The curriculum is taught by qualified and experienced lecturers and/or instructors supported by texts, access to computers, and a library, all delivered in state-of-the-art facilities, and a first-class learning environment.

Course Code	**UGE 02**	**Contact Hours/Week**			
Course Name	**English Language (2)**				
Pre-requisites	**UGE 01**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**1**	**0**	**2**	**3**

Course Description:

This course aims to consolidate the English language skills the students acquired during their freshmen tertiary education. The course focuses on perfecting the skills acquired during their English 101 studies. These objectives are realized by providing the students with a curriculum that is commensurate with the scientific studies they have chosen to pursue. And again, the curriculum is taught by qualified and experienced lecturers and/or instructors supported by texts, access to computers, and a library, all delivered in state-of-the-art facilities, and a first-class learning environment.

Course Code	**UGE 03**	**Contact Hours/Week**			
Course Name	**English Language (3)**				
Pre-requisites	**UGE 02**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**1**	**0**	**2**	**3**

Course Description:

The curriculum framework for English 3 builds on and extends the academic skills taught and practiced in English 1 and 2. The students are required to apply the target skills using materials relevant to the different disciplines at the university. Language continues to develop through the course as the students are engaged in activities which integrate the four language skills.

Course Code	**UEC 01**	**Contact Hours/Week**			
Course Name	**Computer Skills & Programming Concepts (1)**				
Pre-requisites	**None**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**1**	**1**	**2**	**4**

Course Description:

This course tends to provide Year 1 students of all university's faculties with a brief introduction to the world of computers including: numbering systems and digital data representation, computer system architecture, storage and input/output systems, operating systems and Utility Systems, software applications, problem solving techniques and their applications using Flow Charts.

Course Code	**UEC 02E**	**Contact Hours/Week**			
Course Name	**Computer Skills & Programming Concepts (2)**				
Pre-requisites	**UEC 01**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**1**	**1**	**2**	**4**

Course Description:

This course tends to introduce Year 1 students of all university's faculties to the concepts and terminologies of Computer Programming using HLL (Basic or C). The course gives an overview of Databases and Database Management Systems: What are the databases and the advantages for using them? Database concepts, key characteristics about the data in a database, Database classifications and models, practicing on database. The course also introduces students to the internet and the internet services, e.g., Visual Basic.Net.

Course Code	UC 01	Contact Hours/Week			
Course Name	Communication Skills				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	0	0	2

Course Description:

The definition of effective communication and its importance, and to recognize the elements of the communication models and its barriers and filters. In addition to the elements of the message starting from choosing the idea and formulating it and using verbal and nonverbal expression. Also, the course exposure the effective communication skills listening, speaking questioning, writing and reading. The course reviews the persuading theories which is related to the communication and advertising skills, in addition to demonstrating how to prepare effective presentations in front of the target audience and how to deal with him.

Course Code	UGA 03	Contact Hours/Week			
Course Name	Arabic Language Skills				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	0	0	2

وصف المقرر:

يُعنى المقرر بمهارات اللغة العربية الأساسية الضرورية لاستخدام اللغة وسيلةً للتواصل والتوظيف داخل مجالات التخصص المختلفة، مع التركيز على المهارات التنظيمية والفكرية والأسلوبية واللغوية اللازمة في استعمال اللغة وظيفيًا، خاصةً ما تعرض منها لأخطاء شائعة في استخدامها، ويحتاج إلى تصويب من مستخدم اللغة.

6.2 Basic Science Faculty Requirements Courses:

Course Code	EB 101	Contact Hours/Week			
Course Name	Engineering Mathematics (1)				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

This is the first of several mathematics courses which cover most of the basic mathematics needed for engineering degree programs. This course contains the well-recognized elements of classical engineering mathematics which universally underpin the formation of the professional engineer. The main sections are: Algebra (partial fractions, binomial theorem), Analytical Geometry, Differential Calculus (continuity, limits, differentiation, and related applications).

Course Code	EB 102	Contact Hours/Week			
Course Name	Engineering Mathematics (2)				
Pre-requisites	EB 101	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

This Course covers Calculus of one Variable and includes Introduction of integration with applications to area and volumes of revolution, transcendental functions, inverse trigonometric and logarithmic functions, techniques of integrations, and applications that include Centroids. Other topic covered are introduction to differential equations, change of axes and conic sections.

Course Code	EB 111	Contact Hours/Week			
Course Name	Engineering Mechanics (1)				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	3	3	1	0	4

Course Description:

This is a basic subject on Engineering Statics. Emphasis is given to topics that will be useful in other disciplines, including statics of particles, friction, and statics of rigid body, centers of gravity, and introduction to analysis of structures.

Course Code	EB 112	Contact Hours/Week			
Course Name	Engineering Mechanics (2)				
Pre-requisites	EB 111	Lecture	Tutorial	Lab	Total
Credit-Hours	3	3	1	0	4

Course Description:

This is a basic subject on Engineering Dynamics. Emphasis is given to topics that will be useful in other disciplines, including Kinematics of Particles, Kinetics of Particles, and energy and momentum methods.

Course Code	EB 121	Contact Hours/Week			
Course Name	Engineering Physics (1)				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

This course contains the well-recognized elements of classical engineering physics that universally underpin the formation of the professional engineer. It involves the study of: Units and Dimensions, Rotational Motion of Rigid Bodies, Moment of Inertia, Torque; Rotational Energy, Work and Power; Angular and Linear velocity and accelerations, Elasticity: Stress; Strain; Modulus of Elasticity; stored Energy in Strained Solids. Fluid mechanics: Equation of Continuity; Bernoulli's Equation. Viscosity, Poiseuille's Law. Wave motion: types of waves, Sound waves: Doppler Effect. Thermal properties and heat transfer techniques: thermal expansion, heat and internal energy, heat capacity and specific heat. Thermal energy transfer mechanisms. Work and heat in thermodynamic processes. The first law of thermo dynamics.

Course Code	EB 122	Contact Hours/Week			
Course Name	Engineering Physics (2)				
Pre-requisites	EB 121	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

This course is to introduce electricity and further develop fundamental ideas of Electricity and Optics. Lecture topics include: electrical current and resistance, EMF, D.C. circuits and electrical measurements, electric charge, electric field and potential, magnetic fields and their origin, electromagnetic induction. Geometric optics, curved surfaces and Lenses.

Course Code	EB 131	Contact Hours/Week			
Course Name	General Chemistry				
Pre-requisites	-	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	1	2	4

Course Description:

This course introduces the students to Gaseous state, Chemical Equilibrium, Ionic Equilibrium, Liquid State and Solutions, Electrochemical Corrosion, Fuels, Combustion, Water Treatment, Cement and Building materials.

Course Code	EB 141	Contact Hours/Week			
Course Name	Engineering Drawing & Descriptive Geometry (1)				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	3	0	5

Course Description:

i) Engineering Drawing: Introduction, types of lines and lettering, drawing equipments and use of instruments, geometric constructions, the theory of projection, multi view representation, and deduction of the third view.
ii) Descriptive Geometry: Introduction, Mongean Projection: Representation of points, lines, planes. Representation of line intersection of two planes, Representation of point of intersection of a line and a plane, auxiliary planes.

Course Code	EB 142	Contact Hours/Week			
Course Name	Engineering Drawing & Descriptive Geometry (2)				
Pre-requisites	EB 141	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	2	1	4

Course Description:

i) Engineering drawing: The course covers the basic principles of the graphic language that is used by engineers to describe the shape and size of structures and mechanisms and how to employ effectively graphic solutions of space problems.
ii) Descriptive Geometry: The course helps the student to learn fundamental knowledge and understanding of the Prospective, Intersection of curved surfaces.

Course Code	EM 170	Contact Hours/Week			
Course Name	Introduction to Manufacturing Processes				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	1	2	4

Course Description:

This course introduces the student to: Basics of manufacturing processes, engineering materials, machinery, and tooling, methods of joining metals, basic measurement techniques, and cost analysis.

Course Code	HU 113	Contact Hours/Week			
Course Name	Technical Reports Writing & Presentation Skills				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	0	2	3

Course Description:

This course introduces students to further knowledge of English writing skills including spelling, sentence, paragraph and basic essay and letter writing. It provides the students with tools enabling them to communicate their ideas in writing, improves their skills of how to go about researching information and producing well-structured pieces of academic writing. It introduces students to the proper way of writing and presenting a report.

Course Code	HU 121	Contact Hours/Week			
Course Name	Engineering Perspectives and Technology				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	0	2	3

Course Description:

This course provides the students with a background on the development of the concept of technical engineering in the modern period. It includes definitions of art, science, technology, engineering, civilizations and their relationship with natural and human sciences. It sheds the light on the pioneers in engineering with its different branches and specializations, and their roles in the development of contemporary and modern technology. It provides historical link between science & technology.

6.3 Humanities Elective Faculty Requirements Courses:

Course Code	HU 131	Contact Hours/Week			
Course Name	Project Management				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	1	0	3

Course Description:

This course introduces students to the following topics: The importance of project management. Project success factors. Strategic management of projects. Estimating project costs and duration. Network Scheduling techniques: Graphical evaluation and review techniques (GERT), and total PERT/CPM planning. Project graphics. Reducing Project duration. Managing quality on projects.

Course Code	HU 132	Contact Hours/Week			
Course Name	Accounting and Costs for Engineers				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	1	0	3

Course Description:

Introduction to fundamental of accounting and cost estimation. Interest types, capital and investment costs and reproduction costs, concepts and elements of costing systems of measuring production cost,

depreciation expenditure, profitability indicators, optimization, cash flow, project execution, function of stock market, management, balance sheets, and feasibility studies for engineering projects.

Course Code	HU 133	Contact Hours/Week			
Course Name	Engineering Statistics				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	1	0	3

Course Description:

Students are introduced to the use of statistics in engineering. Topics include measures of central tendency, dispersion, probability, sampling, hypothesis testing and estimation, and their application on engineering studies.

Course Code	HU 134	Contact Hours/Week			
Course Name	Engineering Economy				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	1	0	3

Course Description:

This course introduces the basic concepts of micro and macroeconomics. It familiarizes students to applications of such concepts on real life and practical situations.

Course Code	HU 135	Contact Hours/Week			
Course Name	Sales, Marketing and Communication Techniques				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	1	0	3

Course Description:

A three-dimensional course, dealing with sales, marketing, techniques, advertisement and communication with individuals and organizations. It deals with the planning, collection, organization, interpretation and presentation of marketing information and forecasting to aid market decision makers. It includes research methods, types of data, and sources of data and communication techniques in local & international industry.

Course Code	HU 141	Contact Hours/Week			
Course Name	Ethics and Human Rights				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	0	0	2

Course Description:

Theories and development of ethical issues in society; philosophical theories of moral responsibility and moral virtue; philosophical ideas behind ethics debates in society; cognitive status of judgment about what is right and good, about the ground of ethical judgment, and about role and rules and principles of ethical disputes.

Course Code	HU 142	Contact Hours/Week			
Course Name	Legislations and Contracts				
Pre-requisites	None	Lecture	Tutorial	Lab	Total

Credit-Hours	**2**	**2**	**1**	**0**	**3**

Course Description:

This course includes the different legislative rules associated with employment. It also includes the study of all contracts, their conditions and types in different fields with a special reference to the employment law in Egypt.

Course Code	**HU 143**	**Contact Hours/Week**			
Course Name	**Principles of Law**				
Pre-requisites	**None**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**2**	**0**	**0**	**2**

Course Description:

Theory of law: composition, expression, diversity, application, sources, scope and construction of legal rul. Theory of right: definition, diversity, scope, structure, classification, sources and subjects of right.

Course Code	**HU 144**	**Contact Hours/Week**			
Course Name	**Communications Laws and Rules**				
Pre-requisites	**None**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**2**	**0**	**0**	**2**

Course Description:

This course covers methods of communications and the laws and agreements that govern them on both the local and international level with emphasis on the great development of the means of communications in modern & contemporary periods.

Course Code	**HU 151**	**Contact Hours/Week**			
Course Name	**Industrial Safety**				
Pre-requisites	**None**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**2**	**0**	**0**	**2**

Course Description:

This course introduces the concepts underlying the issues related to safety in the different work places. It introduces students to the different relevant industrial safety programs and related systems. It covers an introduction to the implementation of such practices in real situations.

Course Code	**HU 161**	**Contact Hours/Week**			
Course Name	**Environment and Society**				
Pre-requisites	**None**	**Lecture**	**Tutorial**	**Lab**	**Total**
Credit-Hours	**2**	**2**	**0**	**0**	**2**

Course Description:

This course addresses the greenhouse effect, climatic change, global warming, gases contributing to greenhouse effect, air pollution, water pollution, waste water treatment and disposal, solid pollution, solid waste management control and disposal of hazards wastes, industry growth, and noise pollution, environmental development: evaluation of environmental impact of projects, role of university in

dealing with environmental problems and the development of environment, legal and regulation consideration of protection of the environment.

Course Code	HU 162	Contact Hours/Week			
Course Name	Human Computer Interaction				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	0	2	2

Course Description:

The main objective of this course is to provide students with knowledge about the main issues involved in the process of interaction between humans and computers. The process of interaction design is discussed as well as ways for evaluating different designs for different software products or devices used in everyday life. The course introduces the study of ergonomics, cognition and discusses conceptual models. It also introduces data gathering ways and how to deal with persons

Course Code	HU 170	Contact Hours/Week			
Course Name	Risk Management				
Pre-requisites	None	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	0	0	2

Course Description:

Basic risk and reliability concepts; human factors in safety and reliability; safety legalization and role of regulatory bodies; safety, quality and risk management; statistical and probabilistic methods; reliability theory and risk analysis; process control and safety; fire and explosion risks and control reliability analysis of large engineering systems.
Major business risks that caused by changes in economic variables, such as inflation, input prices, wage rates, interest rates, foreign exchange rates, stock prices and economic growth.

6.4 Computer Engineering Department Requirements:

Course Code	EB 103	Contact Hours/Week			
Course Name	Engineering Mathematics (3)				
Pre-requisites	EB 102	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

This course covers more advanced techniques of integration, improper integrals, infinite series (arithmetic series, geometric series, as well as Taylor and Maclaurin series), brief introduction to functions of several variables and their applications, ordinary equations (first and higher orders with constant and variable coefficients) and also systems of differential equations with relevant physical applications.

Course Code	EB 104	Contact Hours/Week			
Course Name	Linear Algebra				
Pre-requisites	EB 102	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

This course covers the fundamentals on matrix theory and linear algebra. Emphasis is given to topics that will be useful in other disciplines, including systems of equations, vector spaces, determinants, Eigen values and Eigen vectors, similarity, and positive definite matrices, Linear Transformations, and Matrix Decomposition.

Course Code	EB 123	Contact Hours/Week			
Course Name	Modern Physics				
Pre-requisites	EB 122	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course covers principles and concepts of Special and General Relativity; origins of Quantum Mechanics; quantum structure of atoms, molecules, solids; applications to lasers and microelectronics; nuclear and particle physics; and cosmology.

Course Code	EB 204	Contact Hours/Week			
Course Name	Engineering Mathematic (4)				
Pre-requisites	EB 103	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

This course covers the fundamental concept of functions of several variables, the calculus of vector function, line integrals, multiple integrals, volume integrals and surface integrals, concept of conservative fields, the definition and theory of Laplace transformation, applying the above concepts and techniques in fluid mechanics and electric fields, application of Laplace transform in solving initial-value problems, and Fourier series

Course Code	EB 208	Contact Hours/Week			
Course Name	Applied Probability & Statistics				
Pre-requisites	EB 204	Lecture	Tutorial	Lab	Total
Credit-Hours	3	3	1	-	4

Course Description:

This course covers descriptive statistics, random variables, probability, probability distributions, estimation, hypothesis testing, Chi-Square, correlation, and simple regression. It also covers review of probability theory; introduction to random walks; counting and Poisson processes; Markov chains in discrete and continuous time; renewal and regenerative processes; introduction to Brownian motion. Selected applications such as queuing and inventory systems, data/communications networks, production planning, computer systems/algorithms, financial/risk management, genetic and epidemic models, and decision analysis

Course Code	EB 207	Contact Hours/Week			
Course Name	Numerical Analysis Using MATLAB				
Pre-requisites	EB 102	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

Course Description:

This is a realization of the necessity of numerical methods in order to simulate technological and scientific processes based on mathematical models. Basic concepts and ideas: algorithm, local linearization, iteration, extrapolation, discretization, convergence, stability, condition. Numerical methods for: linear systems of equations, nonlinear equations and systems of equations, interpolation, model-fitting with the method of least squares, optimization, quadrature, integration, differential equations. The application of mathematical software as MATLAB in the solution of scientific and engineering problems, numerical experimentation, and the presentation of effective algorithms.

Course Code	EC 171	Contact Hours/Week			
Course Name	Discrete Mathematics				
Pre-requisites	EB 102	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	2	0	5

Course Description:

This course aims to acquaint the students with linear algebra concepts, propositional and predicate logic and methods of theorem proving. It introduces the students with methods of proving program correctness, discrete probability and graph theory.

Course Code	EC 121	Contact Hours/Week			
Course Name	Introduction to Digital Logic Design				
Pre-requisites	UEC 01	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

Course Description:

The course introduces an overview of Digital Logic Design: Number Systems, Operations, and Codes, Logic Signals and Gates, Combinational Circuit Analysis and Minimization, Functions of Combinational Logic, Latches, Flip-Flops, and Timers, Counters, Shift Registers, Introduction to Programmable Logic Devices.

Course Code	EC 222	Contact Hours/Week			
Course Name	Advanced Digital Logic Design				
Pre-requisites	EC 121	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

Course Description:

This course is concerned with the design and the implementation of digital systems: Multi-level circuits, PLA, combinational logic structures, memory logic design, synchronous and asynchronous sequential machines. It presents various medium scale integration (MSI) circuits, combinational and sequential programmable logic devices such as ROMs, PLAs, PALs and

the design of application specific integrated circuits (ASCIs) using schematic diagram and VHDL . It explores different types of control units.

Course Code	EC 281	Contact Hours/Week			
Course Name	Microprocessors and Assembly Language				
Pre-requisites	EC 222	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

Course Description:

Fundamentals to microprocessors, Evolution of Intel microprocessors, Internal architecture of the 8088/86 microprocessors, Memory address space and data organization, Microprocessor bus System, Data types and definitions, 8088/86 Microprocessor assembly language programming, addressing modes, MACROS, memory and I/O interfacing, microprocessor interfacing, Interrupt and interrupt applications.

Course Code	EC 361	Contact Hours/Week			
Course Name	Data and Computer Communications				
Pre-requisites	EB 208 – EE 241	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

Introduction, information and coding, data transmission, transmission media, encoding techniques: analog and digital, digital communication techniques, data link control, multiplexing.

Course Code	EC 363	Contact Hours/Week			
Course Name	Computer Networks				
Pre-requisites	EC 361	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	2	1	6

Course Description:

The overall goal of the course is to give the student basic knowledge and skills in local area networks, wide area networks, network architecture layers and corresponding network layer protocols and transport layer protocols, applications, Wireless LANs, the Internet, current trends in the field. Moreover, the course will create a foundation for further studies in IP based LANs and WANs.

6.5. Computer Specialization Compulsory Courses

Course Code	EC 132	Contact Hours/Week			
Course Name	Structured Programming				
Pre-requisites	UEC 02E	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

Course Description:

This course develops algorithmic design and problem solving using structural programming techniques and the C programming language. Programming emphasis will be on block structures and stepwise refinement of algorithms. Programming language paradigms, compilers, program structure, input, output, conditionals, loops, functions, recursion, arrays, pointers, structures and abstract data types are presented. Basic searching and sorting algorithms are studied. Modular coding, parameter passage, correct use of local and global variables and debugging techniques are stressed.

Course Code	EC 233	Contact Hours/Week			
Course Name	Data Structures and Algorithms				
Pre-requisites	EC 132, EC 171	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

Course Description:

The course provides students with adequate knowledge and skills on advanced programming techniques and manipulation of data structures including arrays, linked lists, stacks, queues, trees and hash tables. In addition, the course develops students' skills of specification and representation of linked data structure and its manipulation algorithms. Moreover, an introduction to the analysis of algorithms and recursive calls is provided. Basic sorting and searching algorithms are also illustrated.

Course Code	EC 234	Contact Hours/Week			
Course Name	Object Oriented Programming				
Pre-requisites	EC 132	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	1	2	6

***Course Description*:**

The main Topics are : Object-Oriented Concepts: encapsulation and information-hiding, separation of behavior and implementation, generalization and specialization: objects, scope, attributes, operations and methods, object Identification, object vs. value semantics, classes, object type Identification, class scope, instance creation, inheritance, visibility, polymorphism and virtual method tables. Design methodologies: introducing UML. Introduction to event-driven and concurrent programming and to web programming. Java, C++ and C# overviewed and compared.

Course Code	EC 235	Contact Hours/Week			
Course Name	Advanced Algorithms				
Pre-requisites	EC 233	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course is an introduction to Techniques for analyzing the time and space complexity of algorithms (sequential and recursive). It includes as Applications: sorting, searching, graph problems. It also introduces General design methodologies for problem solving: divide-and-conquer, dynamic programming, B-trees, depth first and breadth first search algorithms, Huffman codes and greedy algorithms. It gives a brief overview of NP-complete problems.

Course Code	EC 271	Contact Hours/Week			
Course Name	Computer Organization				
Pre-requisites	EC 222	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

***Course Description*:**
The main Topics are: Machine architecture: instruction formats, operations, registers, memory, addressing modes. Basic assembler design: design methodology, relocation, basic two-pass design. Advanced assembler design: expressions, complex addressing modes, relocation, literals, program blocks, multi-pass design, one-pass design. Loaders and linkers :absolute loaders, bootstrap loaders, linking loaders, linkages editors, dynamic linking. Macro processors: design of a basic macro processor, recursive design for nested macro definitions, conditional macro expansion. Introduction to APIs.

Course Code	EC 241	Contact Hours/Week			
Course Name	Systems Programming				
Pre-requisites	EC 132	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

***Course Description*:**
The course is an introduction to Machine architecture: design abstractions, a recent chip. Instruction set design. Assessing and understanding performance: CPU performance, evaluating performance, SPEC examples. Processor Micro-architecture: data-path design, multi-cycle design, exceptions, microprogramming, microarchitecture of a recent processor. Pipelined design: pipelined control, data hazards and forwarding, stalls, branch hazards, exceptions, recent processor pipeline. Memory hierarchy: basics of cache design, cache performance, virtual memory, recent memory hierarchies. Buses and interfacing, Performance.

Course Code	EC 292	Contact Hours/Week			
Course Name	Concurrent Programming				
Pre-requisites	EC234	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:
This course introduces Language design parameters, Models of parallel machines, Load balancing, Scalability, Portability, Efficiency measures, Design and implementation techniques for several classes of concurrent programming languages (such as object-oriented, functional, logic, and constraint programming languages).

Course Code	EC 312	Contact Hours/Week			
Course Name	Embedded Systems				
Pre-requisites	EC 281	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

The course introduces the History and overview, embedded microcontrollers, embedded programs, real-time systems, low-power computing, reliable system design, design methodologies, tool support, interfacing and mixed-signal systems, computer system overview, life cycle, requirements analysis and elicitation, specification, architectural design, testing, maintenance, project management nt.

Course Code	EC 342	Contact Hours/Week			
Course Name	Operating Systems				
Pre-requisites	EC 241 – EC 271	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course introduces History and overview of Operating Systems, process concept, concurrency, scheduling and dispatching, memory management, disk scheduling, file systems, virtual machine architecture, security and protection, performance analysis, case studies of operating systems, current trends in operating systems.

Course Code	EC 351	Contact Hours/Week			
Course Name	Database Management Systems				
Pre-requisites	EC 234 , EC 235	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

The main Topics are: organization and access techniques. Introduction to DBMS architecture and environment, structured top down database development lifecycle, data modeling and data flow diagrams. Database organizations: hierarchical, network and relational, relational algebra, ANSI SQL, relational database design, integrity and security of database systems, recovery and concurrency control, query optimization, tuning of physical database design, introduction to Object Oriented DBMS, current trends in DBMS.

Course Code	EC 352	Contact Hours/Week			
Course Name	Software Engineering				
Pre-requisites	EC 351	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course introduces Issues relevant to the development of large software systems, such as specifications, design and synthesis of reliable software.

Course Code	EC 359	Contact Hours/Week			
Course Name	Programming Languages & Translators				
Pre-requisites	EC 241, EC 171	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course introduces translation: interpretation and compilation. Principles of language compilation. Error handling and symbol table management. Run-time storage management.

Course Code	EC 365	Contact Hours/Week			
Course Name	Computer Security				
Pre-requisites	EC 361, EC 342	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course introduces Cryptography, computer security, computer threats, computer networks security. Computer networks threats, Web and email security, Web and email threats, E-commerce security.

Course Code	EC 372	Contact Hours/Week			
Course Name	Computational Models				
Pre-requisites	EC 235	Lecture	Tutorial	Lab	Total
Credit-Hours	2	2	1	0	3

Course Description:

The main Topics are: Regular languages, finite-state automata, and regular expressions: determinism and non-determinism, Chomsky hierarchy, context-free grammars, and push-down automata, Turing machines and recursively enumerable languages: Church's thesis, decidability and the halting problem and computability, The P and NP classes and space classes.

Course Code	EC 383	Contact Hours/Week			
Course Name	Intelligent Systems				
Pre-requisites	EC 234, EC 235	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

The course introduces the students to the Intelligent Systems. It mainly introduces the different problem solving and searching techniques, the knowledge representation, the reasoning and inference, the concept of machine learning, the solution of a real-time problem using Neural Network, the Natural Language and its applications.

Course Code	EC 400-1	Contact Hours/Week			
Course Name	Graduating Project (1)				
Pre-requisites	Department Approval at9th Semester	Lecture	Tutorial	Lab	Total
Credit-Hours	5	3	0	6	9

Course Code	EC 400-2	Contact Hours/Week			
Course Name	Graduating Project (2)				
Pre-requisites	EC 400-1	Lecture	Tutorial	Lab	Total
Credit-Hours	5	3	0	6	9

Course Description:
The main Topics are: Comprehensive project spanning two semesters, students undertake a project which involves addressing a significant technical problem under the guidance of a supervisor. Students are expected to demonstrate an ability to apply a disciplined approach in addressing the solution to the problem. Group cooperation and project management are key issues. Students produce a final thesis on the work and this together with a demonstration of the working system will form the assessment.

6.6. Computer Specialization Elective Courses

Course Code	EC 343	Contact Hours/Week			
Course Name	Workflow Management				
Pre-requisites	EC 233 , EC 234	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:
The course is an introduction to Modeling workflows, management of workflows, analyzing workflows, architecture of workflow systems, standards, Examples.

Course Code	EC 373	Contact Hours/Week			
Course Name	Distributed Systems and Web Services				
Pre-requisites	EC 361, EC 342	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:
The course introduces IPC and RPC standards: CORBA and RMI, web services for B2B projects. XML overview, SOAP protocol, UDDI and WSDL, security issues, middle ware products and multi-tier architecture, new trends.

Course Code	EC 381	Contact Hours/Week			
Course Name	Computer Graphics and Visualization				
Pre-requisites	EC 234, EB 204 and EC 233	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:
The course introduces the principles and techniques for Computer Graphics and Visualization. It introduces Fundamental principles and techniques for computer graphics, Basic raster algorithms, Scene representation, OpenGL, coordinate manipulations, perspective. It also introduces the basics of illumination and shading, color models, texture maps, fundamentals of

scene constructions. It teaches the students how to apply their knowledge of Computer Graphics and Visualization to practical problems.

Course Code	EC 385	Contact Hours/Week			
Course Name	E-business				
Pre-requisites	EC 234	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	1	2	4

Course Description:

The course examines the field of E-business and related fields: e-commerce, e-payment, e-government, E-marketing, e-procurement. Applicable models, process of building a successful E-business functionality, Internet security and customer relationship management. A comprehensive course project is required.

Course Code	EC 386	Contact Hours/Week			
Course Name	Multimedia Systems				
Pre-requisites	EC 361, EC 234	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

The main Topics are: Introduction to multimedia, authoring tools, multimedia data representation, images, audio, video, multimedia data compression: standards, multimedia networks, example applications, current trends.

Course Code	EC 387	Contact Hours/Week			
Course Name	Decision Support Systems				
Pre-requisites	EC 351	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	1	2	4

Course Description:

Definition of DSS, Differences between DSS and management information systems, Phases of data preparation, Data warehousing, Online analytical processing, Data mining. Current trends in DSS.

Course Code	EC 384	Contact Hours/Week			
Course Name	Modelling and Simulation				
Pre-requisites	EB 208 , EC 233	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	1	2	4

Course Description:

This course is an introduction to the fundamentals of system modeling and simulation techniques. It explores simulation definitions, history, background and languages. Conceptualization, implementation, testing, verification and validation of the simulation model are also inspected. In addition, the course studies different types of systems (continuous, discrete time and discrete event, deterministic and stochastic processes). Stochastic features (Monte Carlo, generation of random statistical variables with different probability

distributions) are underlined. Furthermore, Data collection, generation, reduction and analysis are studied. At the end of the course, some applications, such as analytic and simulation techniques for the performance analysis of computer architecture, operating systems and robotics, are studies as well as recent paradigms and applications.

Course Code	EC 395	Contact Hours/Week			
Course Name	Image Processing				
Pre-requisites	EE 241	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:
Expose students to current technologies and issues that are specific to image processing systems, familiarize with MATLAB Image Processing Toolbox

Course Code	EC 313	Contact Hours/Week			
Course Name	Computer Architecture				
Pre-requisites	EC 271	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:
The course introduces Quantitative design approach, computer design problem, technology trends, cost trends, measuring and reporting performance, quantitative principles. Multimedia instruction set design. Addressing modes, operands, operations, control-flow, encoding. Superscalar design, memory hierarchy design, and multiprocessors.

Course Code	EC 362	Contact Hours/Week			
Course Name	Digital Signal Processing				
Pre-requisites	EE 241	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

***Course Description*:**
After the course, each student is expected to be able to use a combination of theory and software implementations to solve signal processing problems, implement and use methods to increase or decrease the data rate of a sampled signal and determine how the signal is affected in the time and frequency domains, use filter banks to split a signal into Sub bands and reconstruct the original signal, know how to discrete-Time Signals and Systems Classification of signals

Course Code	EC 382	Contact Hours/Week			
Course Name	Introduction to Biomedical Engineering				
Pre-requisites	EC 235, EE 232	Lecture	Tutorial	Lab	Total
Credit-Hours	2	1	1	2	4

and systems, linear, time-invariant and time-variant systems, impulse response, convolution, causality and stability.

Course Description:

The main Topics are: Introduction: mathematical modeling, physiological systems: linear system approximation, stochastic modeling, models for: cardiopulmonary system, myocardial mechanics, respiratory mechanics, ECG models, introduction to bioinformatics, recent topics.

Course Code	EC 388	Contact Hours/Week			
Course Name	Introduction to Mechatronics				
Pre-requisites	EE 290, EB 112, EC 312	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

The main Topics are: Overview and historical introduction, physical system modeling, sensors and actuators, data acquisition, control, case stud (automotive), current trends.

Course Code	EC 397	Contact Hours/Week			
Course Name	Advanced Computer Architecture and Parallel Processing				
Pre-requisites	EC 313	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	1	2	5

Course Description:

The main Topics are : fundamentals of the central issues concerning distributed processing, progressing from an overview of hardware aspects, through an introduction to important software concerns, and ending with a discussion of significant issues in the design of distributed applications.

Course Code	EE 326	Contact Hours/Week			
Course Name	Introduction to Robotics				
Pre-requisites	EE 290	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description:

The course aims at teaching fundamental techniques for designing robotics for application in industrial systems. The course covers Robot system elements: type of robots, co-ordinate systems, Robot arms, The range and use of Sensors, Micro-switches, resistance transducers, Piezo-electric, infra-red, laser. Intelligence, sensors, acoustic, speech, touch. It also covers topics of Ultra sonic, bar code readers and Arc sensing in graphic animation, Image, camera geometry, pattern identification. It also covers topic of Hydraulic and electrical system units including pumps, valves, solenoids, cylinders, stepper motors, encoders and AC motors. It also covers topic of Motors, gears, and mechanism design. The course is concluded by teaching

Maze Solving, PID Controller, Advanced topics include Kalman Filters and Topological mapping.

Course Code	EE 291	Contact Hours/Week			
Course Name	Electric Circuits				
Pre-requisites	EB 102, EB 122	Lecture	Tutorial	Lab	Total
Credit-Hours	4	3	2	1	6

Course Description:

This course introduces to electric engineering students fundamentals of electric circuits. It provides students with requirements to analyze and design electric circuits DC and AC. This is achieved by understanding basic theorems, methods of analysis, and lab experiments.

Course Code	EE 232	Contact Hours/Week			
Course Name	Electronics				
Pre-requisites	EE 291	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description

History and overview, electronic properties of materials, diodes and diode circuits, MOS transistors and biasing, MOS logic families, bipolar transistors and logic families, design parameters and issues, storage elements, interfacing logic families. Operational amplifier, circuit modeling and simulation. Integrated circuit building blocks

Course Code	EE 290	Contact Hours/Week			
Course Name	Control systems (I)				
Pre-requisites	EB 204, EE 291	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description

The course introduces an overview for the control system structure. The course covers topics of the basics of control system including: Open loop versus closed loop systems, modeling of physical systems, Transfer function, Block diagram, and Signal flow graph. The course covers performance evaluation of the control system using both types of time response and frequency response. The course covers also analysis of Steady state error and stability of control systems. It also covers Proportional, Integral and Derivative controller: System response and controller tuning.

Course Code	EE 346	Contact Hours/Week			
Course Name	Introduction to Computer Vision				
Pre-requisites	EE 241	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description

The main topics are: Applications of Computer vision, industrial inspection, Robotics and control, image analysis and recognition. Image processing, visual motion computation. Shape representation and recognition. Hardware peripheral, imaging devices, frame grabbers, display devices. Advanced Techniques, Fuzzy logic procedures in computer vision algorithms.

Course Code	EE 391	Contact Hours/Week			
Course Name	Digital Control Systems				
Pre-requisites	EE 290	Lecture	Tutorial	Lab	Total
Credit-Hours	3	2	2	1	5

Course Description

The course introduces feedback computer controlled systems, the components of digital control systems, and system models on the z-domain (z-transfer functions) and on the time domain (state variable representations). The objectives for system design and evaluation of system performance are considered. Various discrete-time controllers are designed including PID-controllers, state and output feedback controllers, and reconstruction of states using observers. The systems with the designed controllers are tested by simulations.

7. Program Admission Requirements:

i. Those who apply to join the program must fulfill all the conditions set by the Supreme Council of Egyptian Universities.
ii. Transfer students, enrolled in a similar program in one of the Faculties of Engineering in Egyptian or foreign universities, may be accepted provided that the student fulfills the requirements for admission to the faculty, and the courses he/she studied in the faculty from which he/she was transferred are counted according to the rules determined by the faculty council.
iii. Students must hold the Egyptian high school certificate, science section or an equivalent certificate accepted by the Supreme Council of Egyptian Universities.
iv. Students are nominated for admission to the faculty according to the rules of the Supreme Council of Private Universities.
v. Foreign students are nominated for admission to the faculty according to the general regulations of the Ministry of Higher Education.
vi. Students must fulfill all requirements and comply with the rules of the faculty.
vii. Full-time study is required by all students.

8. Regulations for Program Course Completion:

In order to complete the requirements for the Bachelor's Degree in Electronics and Communication Engineering, the student should:

a) Pass successfully a total of 177 credit hours distributed over ten semesters including:
b) Achieve CGPA of 2.00 or higher.
c) Fulfil the field training period with a total of 60 training hours in private and governmental engineering companies, factories and training centers that are approved by the faculty council, under the supervision of a faculty staff member. Summer field training takes place during summer vacations after the end of the second level.
d) Pass successfully the graduation project courses.
e) Fulfil any requirements in the faculty academic rules and regulations.

8.3. Examinations Procedure:

- The final grade awarded to student in a course is usually based on the total grades of the course work, practical, written and oral exams according to the table of the study plan.
- The passing percentage of any course should not be less than 60% of the total marks of the course and the student should not get at least 30% in the final written exam.

8.4. Grading System:

Student work in each course is evaluated throughout the semester. At the end of each semester, course grades, credit hours and the cumulative grade point average (CGPA) are recorded on the student's official transcript. Table 21 illustrates the course grading system that is adopted in PUA.

Table 23 Adopted Course Grading System in PUA

Grade		Grade points	Percentage Grade in Faculty of Engineering
Excellent	A+	4.0	≥ 97%
	A	4.0	93% up to less than 97%
	A-	3.7	89% up to less than 93%
Very Good	B+	3.3	84% up to less than 89%
	B	3.0	80% up to less than 84%
Good	B-	2.7	76% up to less than 80%
	C+	2.3	73% up to less than 76%
Pass	C	2.0	70% up to less than 73%
Pass Conditional	C-	1.7	67% up to less than 70%
	D+	1.3	64% up to less than 67%
	D	1.0	60% up to less than 64%
Fail	F	0	Less than 60%
Bylaw	BL	0	Less than 30% in the final written exam

In addition to the previously mentioned 12 grade letters (from A to F & BL), the letter grades shown in Table 23 may appear on the student's official transcript.

Table 23 (Cont.) Adopted Course Grading System in PUA

Grade		Grade points	Percentage Grade in Faculty of Engineering
No Excuse	NE	0	Absent from final exam with no excuse
Deny	DN	0	Denial due to disciplinary penalty
Incomplete	I	-	Incomplete
In Progress	IP	-	In Progress
Withdrawal	W	-	Withdraw
Forced Withdrawal	FW	-	Exceeds 25% absence

Military Withdrawal	MW	-	Withdraw due to Military Service
Satisfactory	NP	-	No Grade Pass
Unsatisfactory	NF	-	No Grade Fail

8.5. Grades not included in the GPA:

- *Incomplete (I):*

  A temporary grade is given to the course or courses that the student was unable to complete on the specified date. Accordingly, when the student completes the course, the actual grade obtained by the student is recorded instead of the grade "I" in the transcript, and grade "I" is not included in the calculation of the average CGPA.

- *In-Progress (IP):*

  A provisional grade that appears on transcripts issued before the end of a given semester. At the end of the semester, "IP" grades are replaced by the actual course grades earned by the student.

- *Withdrawal (W):*

  A grade given to the course or courses from which the student has withdrawn (after the add & drop period till the end of the 12th week), and the grade "W" is not included in the calculation of the average CGPA.

- *Forced Withdrawal (FW):*

  A grade assigned to the course or courses in which the student's absence has exceeded 25% without an excuse. The student is forbidden from attending the final exam and is informed by that. The grade "FW" is not included in the calculation of the average CGPA.

- *No Grade Pass (NP) or No Grade Fail (NF):*

  Grades assigned to courses offered on the basis of pass or fail such as summer training. "NP" and "NF" grades are not included in the calculation of the average CGPA. In case of courses assigned a "NP" grade, credit hours are added to the student earned hours.

- *Absent with excuse (E):*

  A provisional grade assigned to the course or courses in which the student has missed the final written exam with an accepted excuse. After the student undergoes a substitute exam, the actual grade obtained instead of the grade "E" is recorded in the transcript and the grade "E" is not included in the calculation of the average CGPA.

- The student who exceeds 25% absence with excuse is treated as incomplete in the end of semester exam and takes a grade "I".

8.6. Calculation of semester GPA (GPA) and cumulative GPA (CGPA)

a. The grade value of each course (the points shown in the previous table) is multiplied by the number of credit hours for this course to obtain the number of points for each course in the semester.

b. Points are collected for all the courses in which the student is registered in one semester.

c. The total points of all courses are divided by the total credit hours registered for the student in one semester to obtain the semester average as follows:

$$\text{Semester GPA (GPA)} = \frac{\sum \text{Point of all courses in one semester}}{\sum \text{Cr. Hrs in one semester}}$$

$$\text{Cumulative GPA (CGPA)} = \frac{\sum \text{Point of all courses in all semesters}}{\sum \text{Cr. Hrs in all semesters}}$$

8.7. Field Training:

- The field training is obligated for all the students in the program. Each student has to pass the field training period with a total of 60 training days or (8) eight weeks, distributed over the summer holidays from the second stage until the student reaches the fifth stage. Registration for summer training usually begins at the beginning of April and continues until the end of May of the second semester. The field training takes place in private and governmental engineering companies, factories and training centers that are approved by the faculty council, under the supervision of a faculty staff member.
- Pharos university follows specific and clear mechanisms for implementing field training programs for students, in accordance with the regulations of the Field Training Center at the university and supervising them. The Field Training Center, which create cooperation protocols with companies and industrial institutions to provide summer training opportunities for students at university faculties. Also, provides advanced training opportunities to keep pace with the new situation (electronic training).
- Among the engineering institutions and industrial companies with which the Field Training Center cooperated and created training protocols are: The Egyptian Ethylene and Derivatives Company (ETHYDCO) – Alexandria Fertilizer Company (AlexFert) – Sidi Kerir Petrochemicals Company (SIDPEC) – Egyptian Petrochemical Company (EPC) – Alexandria Electricity Distribution Company (AEDC) – Egyptian Projects Operation and Maintenance (EPROM) – Egypt Experts for Software and Hardware (EES) – Behera Company – RunProf LLC (Mobile & Web & Game Development Company – WE telecom Egypt Company –Alexandria Mineral Oils Company (AMOC) – Arab Organization for Industrialization (AOI) – Alexandria National Refining & Petrochemicals Company (ENRPC) – Alexandria

Specialty Petroleum Products Company (ASPPC) – The Egyptian Electricity Transmission Company "Alexandria Region" – Alexandria Port Authority.

- The Computer Engineering Program has prepared a specification of field training for students according to the learning outcomes and program competencies.
- There is also a Field Training Committee within the organizational structure of the Faculty of Engineering. It is headed by the field training coordinator of the faculty and a training coordinator for each department, under the supervision of the Vice Dean for Education and Student Affairs. One of its most important tasks is to distribute training to students, follow-up and implementation.
- Although the field training takes place externally, the faculty's Field Training Committee provides appropriate halls for the meetings of the field training supervisors with students in the qualifying week every summer vacation, and in the meeting with the students, they are introduced to the field training program, the models used, and the instructions for the field training.
- Forms of student follow-up reports and performance evaluation are prepared during the implementation of the practical training program. Coordination is made with the supervisors of practical training programs in engineering institutions and the department's training coordinator to follow up on their seriousness in implementing the approved practical program and follow-up to the extent of the student's commitment to work and to get used to discipline and seriousness at work through evaluation forms. Where the department's staff members and their assistants are distributed to follow-up the process of training students in engineering institutions.
- Questionnaires are prepared for students to measure the effectiveness of training programs and to identify problems that hinder the student's professional preparation and deepening of his knowledge. Based on the results of these questionnaires, a corrective plan is drawn up to avoid difficulties, and the Faculty's Field Training Committee prepares a report on field training at the end of each summer vacation.
- The Program uses various methods and tools to evaluate the performance of students in training to ensure the achievement of the required objectives of training and the planned educational outputs, and to make maximum use of students from their performance in the specified period of training. This is shown in the training field evaluation forms, which includes: student's evaluation form internally from the supervisor (a staff member or assistant from the department), the student's evaluation from the training entity. The student submits a presentation on what has been trained and is evaluated by a specialized committee in the department using the report evaluation form prepared by the student, and the student's evaluation scores are collected by the training authority, supervisor, and presentation in the student's final evaluation form. Finally, the student is granted a certificate after successfully passing the training period from the training authority.
- The student must spend the specified training period with the supervisors of practical training programs in engineering institutions that has appointed him or that has been

approved by the field training committee, and not move to another agency except after obtaining official approval from each committee, the training destination and the training supervisor while informing the academic advisor. And adherence to the rules and regulations of the work of the training authority. And that the student gathers the information and elements necessary to write the final report of the field training.

- The faculty also prepares internship programs for students in the laboratories of the various scientific departments during the summer vacation, in coordination with the heads of the departments and the committee of laboratories and engineering workshops.

9. Teaching and Learning Methodologies:

Lectures	Tutorials
Laboratory Sessions	Presentations
Reports	Group Discussions
Mini-Projects	Case Studies
Projects	Simulation
Self-Learning	Flipped Classrooms
Group Solving Problems	Problem-Based Learning
Team-Based Learning	Brain Storming
Blended Learning	

9.1.Teaching and Learning Methodologies of All Courses in the Program:

No.	Code	Course	Lecture	Tutorial	Laboratory Sessions	Brain Storming	Group Solving Problems	Reports	Presentations	Case Studies	Simulations	Mini-Projects	Group Discussions	Problem-Based Learning	Flipped Classrooms	Team-Based Learning	Blended Learning	Self-Learning	Projects
1	EB 101	Engineering Mathematics (1)	√	√	√	√	√	√				√	√	√			√		
2	EB 111	Engineering Mechanics (1)	√	√		√		√					√	√					
3	EB 121	Engineering Physics (1)	√	√	√		√						√	√					
4	EB 141	Eng. Drawing & Descriptive Geometry (1)	√	√		√	√			√		√	√	√		√			
5	UEC 01	Computer Skills & Programming Concepts (1)	√	√	√	√	√						√	√					
6	HU 121	Engineering Perspectives and Technology	√		√	√	√	√	√			√	√	√	√				
7	EB 131	General Chemistry	√	√	√								√	√					
8	EB 102	Engineering Mathematics (2)	√	√	√	√	√	√				√	√	√			√		
9	EB 112	Engineering Mechanics (2)	√	√		√	√	√					√	√					
10	EB 122	Engineering Physics (2)	√	√	√		√						√	√					
11	EB 142	Eng. Drawing & Descriptive Geometry (2)	√	√		√	√			√		√	√	√		√			
12	UCS 01	Communication Skills (1)			√				√	√			√			√			
13	UEC 02E	Computer Skills & Programming Concepts (2)	√	√	√	√	√						√	√			√		
14	UGE 01	English Language (1)	√		√								√			√	√		

No.	Code	Course	Lecture	Tutorial	Laboratory Sessions	Brain Storming	Group Solving Problems	Reports	Presentations	Case Studies	Simulations	Mini-Projects	Group Discussions	Problem-Based Learning	Flipped Classrooms	Team-Based Learning	Blended Learning	Self-Learning	Projects
15	EM 170	Introduction to Manufacturing Processes	√	√	√								√						
16	HU 113	Technical Reports Writing and Presentation Skills	√		√		√	√		√			√	√					
17	EB 103	Engineering Mathematics (3)	√	√	√	√	√	√				√	√	√			√		
18	EB 123	Modern Physics	√	√	√		√						√	√	√			√	
19	EE 291	Electric Circuits	√	√	√	√					√	√	√	√		√			
20	EB 104	Linear Algebra	√	√	√		√						√	√	√				
21	EB 204	Engineering Mathematic (4)	√	√	√	√		√				√	√	√			√		
22	UGE 02	English Language (2)	√		√					√			√			√	√		
23	EB 207	Numerical Analysis using MATLAB	√	√	√	√	√						√	√			√		
24	EE 241	Signals and Systems	√	√	√	√	√				√		√	√					
25	**EB 208**	Applied Probability and Statistics	√	√		√		√					√	√	√				
26	***HU Elective (1):***																		
	HU 141	Ethics and Human Rights	√			√							√						
	HU 142	Legislations and Contracts	√	√		√							√						
	HU 143	Principles of Law	√			√							√						
	HU 144	Communications Laws and Rules	√			√							√						

No.	Code	Course	Lecture	Tutorial	Laboratory Sessions	Brain Storming	Group Solving Problems	Reports	Presentations	Case Studies	Simulations	Mini-Projects	Group Discussions	Problem-Based Learning	Flipped Classrooms	Team-Based Learning	Blended Learning	Self-Learning	Projects
27	***HU Elective (2):***																		
	HU 131	Project Management	√	√								√	√	√	√			√	
	HU 132	Accounting and Costs for Engineers	√	√								√	√	√	√			√	
	HU 134	Engineering Economy	√	√								√	√	√	√			√	
	HU 135	Sales, Marketing and Communication Techniques	√	√								√	√	√	√			√	
28	EE 290	Control Systems (1)	√	√	√	√					√		√	√					
29	UGA 03	Professional Communication in Arabic Language	√			√							√						
30	UGE 03	English Language (3)	√							√	√		√			√	√		
31	EC 400-1	Graduating Project (1)	√	√	√	√		√	√	√	√		√		√	√		√	√
32	EC 400-2	Graduating Project (2)	√	√	√	√		√	√	√	√		√		√	√		√	√
33	UCS 02	Communication Skills (2)			√				√	√			√			√			
34	EC 121	Introduction to Digital Logic Design	√	√	√		√					√							
35	EC 132	Structured Programming	√	√	√	√	√				√		√						
36	EC 171	Discrete Mathematics	√				√						√		√				
37	EC 233	Data Structures and Algorithms	√	√	√		√	√			√		√						

No.	Code	Course	Lecture	Tutorial	Laboratory Sessions	Brain Storming	Group Solving Problems	Reports	Presentations	Case Studies	Simulations	Mini-Projects	Group Discussions	Problem-Based Learning	Flipped Classrooms	Team-Based Learning	Blended Learning	Self-Learning	Projects
38	EC 222	Advanced Digital Logic Design	√	√	√		√					√							
39	EE 232	Electronics	√	√	√			√	√			√		√		√			
40	EC 241	Systems Programming	√	√		√		√			√						√		
41	EC 234	Object Oriented Programming	√	√	√						√								
42	EC 235	Advanced Algorithms	√	√		√	√				√	√	√	√		√			
43	EC 271	Computer Organization	√	√	√						√								
44	EC 292	Concurrent Programming	√	√	√						√								
45	EC 359	Programming Languages & Translators	√	√	√			√			√			√			√		
46	HU 162	Human Computer Interaction	√	√	√		√		√			√				√			
47	EC 281	Microprocessors and assembly language	√	√	√							√							
48	EC 342	Operating Systems	√	√	√						√								
49	EC 351	Database Management Systems	√	√	√	√					√								
50	EC 372	Computational Models	√	√	√	√			√		√								
51	EC 361	Data and Computer Communications	√	√	√						√		√						
52	EC 312	Embedded Systems	√	√	√							√							

No.	Code	Course	Lecture	Tutorial	Laboratory Sessions	Brain Storming	Group Solving Problems	Reports	Presentations	Case Studies	Simulations	Mini-Projects	Group Discussions	Problem-Based Learning	Flipped Classrooms	Team-Based Learning	Blended Learning	Self-Learning	Projects
53	EC 352	Software Engineering	√	√	√	√		√	√									√	√
54	EC385	E-business	√	√	√			√											
55	EC395	Image Processing (elective group 1)	√	√						√			√						
56	EC 363	Computer Networks	√	√	√		√		√			√	√						
57	EC313	Computer Architecture (elective group 2)	√	√	√	√					√								
58	EC 373	Distributed Systems and Web Services (elective group1)	√	√	√			√										√	√
59	EC 381	Computer Graphics and Visualization (elective group 1)	√	√	√	√	√				√	√							
60	EC 365	Computer Security	√	√	√	√										√			
61	EC 383	Intelligent Systems	√	√	√		√		√		√			√				√	√
62	EC 384	Modelling and Simulation (elective group1)	√	√		√					√			√					
63	EC 362	Digital Signal Processing (elective group 2)	√	√	√				√		√		√	√	√				

9.2. Matching Matrix between Teaching and Learning Methodologies and Program Competencies:

Teaching &Learning Strategies	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
Lecture	1		1	1				1		1	1	1				1	1	1	1
Tutorial	1							1			1	1				1	1	1	1
Laboratory sessions		1					1	1				1	1	1	1	1	1	1	1
Presentations			1	1	1		1	1			1					1	1	1	
Reports		1	1	1	1		1	1			1					1			
Group discussions			1				1		1			1	1	1	1	1			
Min-project		1	1				1		1			1	1	1	1	1	1		
Case Studies	1	1	1	1	1	1	1		1	1		1				1		1	1
Projects		1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1
Simulation		1										1	1	1	1	1	1	1	1
Flipped class room				1			1	1		1							1	1	
Self-learning			1	1	1		1			1						1	1		1
Problem based learning	1										1						1		
Group solving problems	1						1		1		1					1	1		
Brain storming	1	1	1	1	1	1	1		1	1	1					1	1	1	1
Team based learning	1	1	1		1	1	1		1	1						1	1	1	1
Blended learning	1	1			1						1			1		1	1		

9.3. Teaching and Learning Methodologies for Low-Capacity and Outstanding Students:

For Low-Capacity Students	For low skills student, instructors argue and encourage them via additional explanation, discussion of simpler problems, offering more interactive teaching & learning methods and assigning specific tasks to them. In addition to, arranging field trips, monitoring them in labs, and helping them in office hours by answering their questions and re-explaining the unclear sections.
For Outstanding Students	Instructors guide high-skilled students to additional readings in advanced literatures and acknowledge them with industrial & practical challenging problems and research projects. In addition to, assigning additional tasks and problems designed for high skills students.

10. Methods and Rules for Evaluating Those Enrolled in the Study Program

Methods of evaluation are updated and tailored to be able to measure competencies that should be achieved and to meet the requirements of the new teaching and learning strategy of blended learning.

Written Exams	Practical Lab Assessments and Exams
IT-Application Lab Assessments and Exams	Quizzes
Solving Assignment Problems	Reports
Presentations	Mini-Projects
Interactive Learning	Projects

10.1. Matching Matrix between Assessment Methodologies and Program Competencies:

Assessment strategies	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
Written Exams	1									1	1	1		1	1	1	1	1	1
Practical lab assessment and exams		1										1	1	1	1	1	1	1	1
It-application lab assessment and exam		1										1	1	1	1	1	1	1	1
Quizzes	1										1	1		1	1	1	1	1	1
Solving assignment problem	1		1		1						1			1	1		1		
Reports		1	1	1	1		1	1	1		1					1			
Presentations			1	1	1		1	1	1		1					1	1	1	
Mini project		1	1			1	1		1	1		1	1	1	1	1	1		
Projects		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1

11. Methods and Rules for Evaluating the Program's Competencies and Learning Outcomes

Evaluator	Tool	Sample	% Contribution in Total Marks of Program Evaluation
Students	Questionnaires and periodic meetings	Questionnaires (**45**%)	18%
Graduates	Program coordinator, meeting staff member & questionnaires	Questionnaires (10%)	10%
Stakeholders (Employers)	Program coordinator, meetings & questionnaires	One meeting / year	10%
Staff Examiners Committee	Reviewing and evaluating exams and graduation projects	Once / semester	17%
External Examiners	Evaluating the graduation projects	At least one external examiner for each graduation project	10%
External Reviewer of Exams	Revising all 5th year final examinations	At least one external reviewer every semester	5%
Internal Reviewer of Program	Reviewing of the specifications of the program and the courses according to the bylaw	At least one internal reviewer professor in the specialty	15%
KTH	**Reviewing of semester's final examinations, statistics and graduation projects' thesis and presentations**	One meeting and follow-up reports / semester	15%

Program Coordinator

Prof. Dr. Magdi Abd El AZIM 17/8/2021

Faculty Dean:

Prof. Dr. Mohamed Gaber Abo-Ali

Appendix

	course code	Course name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
1st Semester	EB 101	Engineering Mathematics (1)	1									1									
	EB 121	Engineering Physics (1)	1	1					1			1									
	EB 141	Engineering Drawing & Descriptive Geometry (1)							1			1									
	UEC 01E	Computer Skills & Programming Concepts (1)	1	1	1	1					1	1									
	EB 111	Engineering Mechanics (1)	1						1			1									
	HU 121	Engineering Perspectives and Technology	1		1				1	1											
	UGE 01	English Language (1)							1	1		1									
2nd Semester	BE 102	Engineering Mathematics (2)	1									1									
	EB 112	Engineering Mechanics (2)	1						1			1									
	EB 122	Engineering Physics (2)	1	1					1			1									
	EB 142	Engineering Drawing & Descriptive Geometry (2)							1			1									
	UEC 02E	Computer Skills & Programming Concepts (2)	1	1	1	1					1	1									
	EB 131	General Chemistry	1	1		1			1			1									
	UGE 02	English Language (2)							1	1		1									
	UEC 02E	Computer Skills & Programming Concepts (2)	1	1	1	1					1	1									
	EM 170	Introduction to Manufacturing Processes	1		1	1		1	1			1									
3rd Semester	EC 121	Introduction to Digital Logic Design					1	1							1	1	1				1
	EC 132	Structured Programming			1			1						1	1			1			
	EC 171	Discrete Mathematics	1		1		1			1						1	1				
	EB 103	Engineering Mathematics (3)	1									1									
	EE 291	Electric Circuits	1	1				1					1	1	1	1					
4th Semester	EB 204	Engineering Mathematics (4)	1									1									
	EB 104	Linear Algebra	1									1									
	EC 233	Data Structures and Algorithms	1		1						1			1	1			1			
	EC 222	Advanced Digital Logic Design					1	1							1	1	1				1
	EE 232	Electronics		1									1	1	1	1					
5th Semester	EC 241	Systems Programming				1	1				1						1				
	EB 207	Numerical Analysis with MATLAB	1									1									
	EB 123	Modern physics	1	1					1			1									
	UGE 03	English Language (3)							1	1		1									
	EB 208	Applied Probability	1	1								1									
	EC 234	Object Oriented Programming					1							1	1			1	1		
6th Semester	EC 235	Advanced Algorithms						1						1	1			1	1		
	EC 271	Computer Orgnization					1	1						1	1	1					
	EC 292	Concurrent Programming					1	1						1				1	1		1
	EC 359	Programming Languages & Translators															1	1	1	1	
	HU 113	Technical Reports Writing and Presentation Skills					1		1	1											
	UGA 03	Arabic Language Skills							1	1		1									
	HU 162	Human Computer Interaction	1		1	1						1									
7th Semester	EC 281	Microprocessors and assembly language						1						1	1	1				1	
	EC 342	Operating Systems					1	1						1		1		1	1		
	EC 351	Database Management Systems					1				1			1				1	1		1
	EC 372	Computational Models		1	1			1						1		1					
	EE 241	Signals and systems	1	1											1						
8th Semester	EC 361	Data and Computer Communications		1			1								1	1	1				1
	EC 312	Embedded Systems					1							1	1	1				1	
	EC 352	Software Engineering		1	1			1											1	1	1
	EC395	E-business		1	1	1				1	1										
	HU 141	Ethics and Human Rights (or any elective of HU couses)			1	1			1			1									
	EC395	Image Processing (elective group 1)							1		1				1		1	1		1	
9th Semester	EE 290	Control system (1)		1											1	1					
	EC 363	Computer Networks		1			1								1	1	1				1
	EC 400-1	Graduation Project (1)				1				1	1		1		1	1	1	1	1	1	1
	EC313	Computer Architecture (elective group 2)												1	1	1		1		1	1
	EC373	Distributed Systems and Web Services (elective group1)							1		1				1		1	1		1	
	EC381	Computer Graphics and Visualization (elective group 1)													1		1	1		1	
10th Semester	EC 365	Computer Security				1								1	1			1	1		1
	EC 383	Intelligent Systems									1				1	1		1	1		1
	UC 01	Communication Skills							1	1	1	1									
	EC 400-2	Graduation Project (2)				1				1	1		1		1	1	1	1	1	1	1
	EC384	Modelling and Simulation (elective group1)							1		1				1		1	1		1	
	EC362	Digital Signal Processing (elective group 2)												1	1	1		1		1	1
		field training				1				1	1			1		1	1	1	1	1	1

ELECTIVE GROUP 1	EE 346	Introduction to computer vision (elective group 1 - not open)							1		1				1		1	1		1	
	EC343	Workflow Managemet) (elective group 1 - not open)							1		1				1		1	1		1	
	EC386	Multimedin Systems (elective group 1 - not open)							1		1				1		1	1		1	
	EC387	Decision Support Systems (elective group 1 - not open)							1		1				1		1	1		1	
	EC384	Modelling and Simulation (elective group1)							1		1				1		1	1		1	
	EC381	Computer Graphics and Visualization (elective group 1)							1		1				1		1	1		1	
	EC373	Distributed Systems and Web Services (elective group1)							1		1				1		1	1		1	
	EC395	Image Processing (elective group 1							1		1				1		1	1		1	
ELECTIVE GROUP 2	EC382	Introduction to Biomedical Engineering (elective group 2 not open)												1	1	1		1		1	1
	EC388	Introduction to Mechatronics (elective group 2 not open)												1	1	1		1		1	1
	EC397	Advanced Computer Architecture and Parallel Processing (elective group 2 not open)												1	1	1		1		1	1
	EE391	Digital Control Systems (elective group 2 not open)												1	1	1		1		1	1
	EE 326	Introduction to Robotics (elective group 2 not open)												1	1	1		1		1	1
	EC362	Digital Signal Processing (elective group 2)												1	1	1		1		1	1
	EC313	Computer Architecture (elective group 2)												1	1	1		1		1	1
ELECTIVW	EC385	E-business (elective gropup)		1	1					1	1	1									
	HU 164	Research Methods&Techniques					1		1	1			1								
	HU 141	Ethics and Human Rights			1	1			1				1								
	HU 142	Legislations and Contracts			1	1			1				1								
	HU 143	Principles of Law			1	1			1				1								
	HU 144	Communications Law and Rules			1	1			1				1								
	HU 131	Project Management			1		1		1		1										
	HU 132	Accounting and Cost for Engineering			1		1		1		1										
	HU 134	Engineering Economy			1		1		1		1										
	HU 135	Sales, Marketing and Communications Techniques			1		1		1		1										
	HU 163	Astronomy and Space Sciences	1		1	1							1								
	HU 133	Engineering Statistics	1	1									1								
	HU 151	Industrial Safety				1	1														
	HU 161	Environment and Society			1					1											
	HU 170	Risk Managment		1		1							1								

Gap Analysis Between NARS 2009 of Computer Engineering Program and ARS of Computer Engineering (According to NARS 2018)

Competency alludes to the description of the knowledge, skills, experience, and attributes necessary to carry out a defined function effectively. In order to analyze the gap between Computer Engineering NARS 2009 and ARS (According to NARS 2018) of the Computer Engineering program, the following steps have been performed:

First: Preparing Gap Analysis Matrix Between Intended Learning Outcomes (ILOs) of NARS 2009 and Competencies of ARS (According to NARS 2018):

Table (1): The Cross Match between the skills of NARS 2009 and Competencies of ARS (according to NARS 2018).

ARS (According to NARS 2018)	NARS 2009
Competencies of Engineering Graduate – Level A	Academic Reference for Engineering: 1- Knowledge & Understanding skills. 2- Intellectual skills. 3- Professional skills. 4- General skills.
Competencies of Computer Engineering Graduate – Level B	Academic Reference for Discipline: 1- Knowledge & Understanding skills. 2- Intellectual skills. 3- Professional skills.
Competencies of Computer Engineering Graduate – Level C	Academic Reference for Discipline: 1- Knowledge & Understanding skills. 2- Intellectual skills. 3- Professional skills.

1.1. Competencies of ARS (according to NARS 2018):

According to the NARS-Engineering 2018; the graduates of the Engineering Programs should be able to satisfy the General Competencies (Level-A) as follows:

A.1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A.2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A.3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A.4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

A.5. Practice research techniques and methods of investigation as an inherent part of learning.

A.6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

A.7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.

A.8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

A.9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

A.10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

According to the NARS-Engineering 2018; the graduates of the Computer Engineering Program should be able to satisfy the Electrical Engineering Competencies (Level-B) as follows:

B.1. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.

B.2. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

B.3. Design and implement: elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.

B.4. Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.

B.5. Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

In addition to the competencies for all General Engineering and Electrical Engineering program according to the ARS-Engineering 2018; the graduates of the Computer Engineering (according to ARS) should be able to satisfy the computer Engineering Competencies (Level-C) as follows:

C.1 Design, implement, test a complete computer system including function specifications, requirements, and performance

C.2 Understanding basic and theoretical foundation of Computer science including Algorithms, Programming and Data Bases.

C.3 Illustrate the technology necessary to build analogue and digital systems, automatic control systems and demonstrate the basic building blocks and organization of the computer including microprocessor

C.4 Use appropriate specialized software packages, write computer programs, use relevant laboratory equipment for the analysis and design of systems, Design, Select, and apply Artificial Intelligence based solutions

1.2. Intended Learning Outcomes (ILOs) of Computer Engineering according to NARS 2009:

1.2.1. Knowledge and Understanding Skills:

A1. Concepts and theories of mathematics and sciences, appropriate to the discipline.

A2. Basics of information and communication technology (ICT)

A3. Characteristics of engineering materials related to the discipline.

A4. Principles of design including elements design, process and/or a system related to specific disciplines.

A5. Methodologies of solving engineering problems, data collection and interpretation

A6. Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

A7. Business and management principles relevant to engineering.

A8. Current engineering technologies as related to disciplines.

A9. Topics related to humanitarian interests and moral issues.

A10. Technical language and report writing

A11. Professional ethics and impacts of engineering solutions on society and environment

A12. Contemporary engineering topics

A13. Engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems and reliability analysis.

A14. Quality assessment of computer systems.

A15. Related research and current advances in the field of computer software and hardware.

A16. Technologies of data, image and graphics representation and organization on computer storage media.

A17. Modern trends in information technology and its fundamental role in business enterprises.

1.2.2 *Intellectual Skills:*

B1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

B2. Select appropriate solutions for engineering problems based on analytical thinking.

B3. Think in a creative and innovative way in problem solving and design.

B4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

B5. Assess and evaluate the characteristics and performance of components, systems and processes.

B6. Investigate the failure of components, systems, and processes.

B7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

B8. Select and appraise appropriate ICT tools to a variety of engineering problems.

B9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

B10. Incorporate economic, societal, environmental dimensions and risk management in design.

B11. Analyze results of numerical models and assess their limitations.

B12. Create systematic and methodic approaches when dealing with new and advancing technology.

B13. Select the appropriate mathematical tools, computing methods, design techniques for modeling and analyzing computer systems.

B14. Select, synthesize, and apply suitable IT tools to computer engineering problems.

B15. Proposing various computer-based solutions to business system problems. Cost-benefit analysis should be performed especially in sensitive domains where direct and indirect costs are involved.

B16. Identifying symptoms in problematic situations.

B17. Innovating solutions based on non-traditional thinking and the use of latest technologies.

B18. Capability of integrating computer objects running on different system configurations.

1.2.3. Professional and Practical Skills:

C1. context and engineering practice integrally to solve engineering problems.

C2. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.

C3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

C4. Practice the neatness and aesthetics in design and approach.

C5. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.

C6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

C7. Apply numerical modeling methods to engineering problems

C8. Apply safe systems at work and observe the appropriate steps to manage risks

C9. Demonstrate basic organizational and project management skills.

C10. Apply quality assurance procedures and follow codes and standards.

C11. Exchange knowledge and skills with engineering community and industry.

C12. Prepare and present technical reports.

C13. Design and operate computer-based systems specifically designed for business applications.

C14. Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development;

C15. Write computer programs on professional levels achieving acceptable quality measures in software development.

C16. Conducting user support activities competently.

1.2.4. General and Transferable Skills:

D1. Collaborate effectively within multidisciplinary team.

D2. Work in stressful environment and within constraints.

D3. Communicate effectively.

D4. Demonstrate efficient IT capabilities.

D5. Lead and motivate individuals.

D6. Effectively manage tasks, time, and resources.

D7. Search for information and engage in life-long self-learning discipline.

D8. Acquire entrepreneurial skills.

D9. Refer to relevant literatures.

Table (2): The Cross Match between the ILOs of NARS 2009 and Competencies of ARS (according to NARS 2018) of Computer Engineering

Intended Learning Outcomes (ILOs) of NARS 2009	Knowledge and Understanding Skills		General Engineering Competencies (NARS 2018)										Electrical Engineering Competencies (NARS 2018)					Computer Engineering Competencies (ARS)			
			A.1	A.2	A.3	A.4	A.5	A.6	A.7	A.8	A.9	A.10	B.1	B.2	B.3	B.4	B.5	C.1	C.2	C.3	C.4
		A1	√																		
		A2				√															
		A3	√																		
		A4			√									√	√		√				
		A5	√	√																	
		A6				√											√				
		A7			√																
		A8				√															
		A9			√																
		A10								√											
		A11			√																
		A12				√															
		A13											√	√				√	√	√	
		A14														√			√		√
		A15													√				√	√	√
		A16														√	√				√
		A17			√	√															

Intellectual Skills	B1	√	√																	
	B2	√																		
	B3									√										
	B4								√		√									
	B5														√					
	B6									√			√							
	B7	√																		
	B8				√									√						
	B9			√	√															
	B10			√	√															
	B11		√																	
	B12									√										
	B13	√	√									√							√	
	B14	√	√				√					√				√	√	√		√
	B15			√	√									√	√		√		√	
	B16									√						√		√		
	B17		√																	√
	B18					√							√				√			√
Professional Skills	C1	√																	√	√
	C2				√		√								√				√	√
	C3			√			√						√	√						
	C4			√	√		√									√			√	√

		C5		√					√							√					
		C6		√											√			√		√	
		C7	√											√							
		C8				√												√		√	
		C9			√	√		√												√	
		C10				√												√			
		C11			√	√						√						√		√	√
		C12					√			√											
		C13		√												√		√			
		C14													√	√		√			√
		C15		√										√	√	√		√			√
		C16														√	√				
	General Skills	D1							√												
		D2								√	√										
		D3							√	√											
		D4		√																	
		D5							√		√										
		D6						√													
		D7					√					√									
		D8									√										
		D9	√																		

By examining the matching matrix, it was found that there are some extra expressions in ARS (according to NARS 2018), such as:

A.3: Sustainable design and development.

A.5: Methods of investigations as an inherent part of learning.

A.7: Function efficiently as a member of multi-cultural teams.

A.10: Practice other learning strategies.

C.4: Apply Artificial intelligence based solution

Second: Preparing Gap Analysis Matrix Between Graduate Attributes of NARS 2009 and Graduate Attributes of ARS of Computer Engineering according to NARS 2018:

According to the NARS-Engineering 2018; the graduates of the engineering programs should be able to satisfy the attributes listed below:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
7. Use techniques, skills and modern engineering tools necessary for engineering practice.
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

While according to NARS-Engineering 2009; the graduates of the Computer Engineering program should be able to satisfy the attributes listed below:

a) Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.

b) Design a system; component and process to meet the required needs within realistic constraints.

c) Design and conduct experiments as well as analyze and interpret data.

d) Identify, formulate and solve fundamental engineering problems.

e) Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.

f) Work effectively within multi-disciplinary teams.

g) Communicate effectively.

h) Consider the impacts of engineering solutions on society & environment.

i) Demonstrate knowledge of contemporary engineering issues.

j) Display professional and ethical responsibilities; and contextual understanding

k) Engage in self- and life- long learning.

l) Demonstrate inductive reasoning abilities, figuring general rules and conclusions about seemingly unrelated events

m) Use current advanced techniques, skills, and tools necessary for computing practices to specify, design, and implement computer-based systems.

n) Recognize the information requirements of various business activities on both operational and decision making levels.

o) Tackling business problems using system analysis tools and techniques.

p) Managing projects related to computer systems in diverse fields of applications.

q) Implementing phases of the computer system development life cycle, procurement and installation of hardware, software design, data manipulation and system operations

Table (3): The cross match between the Graduate Attributes of NARS 2009 and Graduate Attributes of ARS According To NARS 2018 Of Computer Engineering Program .

		General Engineering Graduate Attributes of NARS 2018									
		1	2	3	4	5	6	7	8	9	10
General Engineering Graduate Attributes (NARS 2009)	a	√									
	b	√									
	c	√	√								
	d		√								
	e							√			√
	f				√						√
	g									√	
	h						√				
	i					√					
	j			√							
	k								√		
Computer Engineering	l	√									
	m	√	√								
	n	√									√

	o		√								√
	p	√			√			√			
	q	√						√			

By examining the matching matrix, it was found that there are some extra expressions in ARS (according to NARS 2018), such as:

8. Demonstrate the capacity to engage in post-graduate and research studies.

Third: Proposed Action Plan to Overcome the Gap:

- Update course specifications for some course to add sustainability and development topics and link them with the 17 Goals of Sustainable Development Goals founded by the United Nations (UN).
- Offer graduation projects in the fields linked to the Egyptian National Strategy for Science, Technology and Innovation 2030.
- Encourage the graduation projects' students to participate in the national and international competition.
- Update the graduation projects' mechanism to pace with the KTH requirements and follow the Swedish educational quality; by acquiring the students with the necessary skills for writing a professional grad book and using various methods of investigations during the projects' stages.
- Ensure cooperation with a number entrepreneur in supervising graduation projects alongside academic staff to achieve scientific and practical goals at the same time
- Update program's teaching and learning strategies to include modern interactive techniques such as flipped classroom, self-learning, team-based learning, and blended learning (through Blackboard Platform).
- Offer graduation projects in the fields of Artificial Intelligence (AI), Internet of Things (IoT)and smart systems
- Provide summer training opportunities for the students related to the discipline and contemporary engineering problems in society.
- Motivate the graduation projects' students to publish their researches in conferences and journals especially the projects which address social and industrial problems.

- Applying research technique and references styles in the course of HU164 methods.

Table (4): Gap Analysis in Competencies and Graduate Attributes Between the NARS 2009 & NARS 2018

I- Competencies

N.B: Gaps in graduate attributes are Underlined

Competencies Containing gap	Bylaw Containing Gap	Action Plan
A.3. Apply engineering design processes to **produce cost-effective solutions that meet specified needs** with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of **sustainable design and development.**	All Courses + EE 400-1: Graduation Project (1) + EE 400-2: Graduation Project (2) + Field Training	• Update course specifications for some course to add sustainability and development topics and link them with the 17 Goals of Sustainable Development Goals founded by the United Nations (UN). • Offer graduation projects in the fields linked to the Egyptian National Strategy for Science, Technology and Innovation 2030. • Encourage the graduation projects' students to participate in the national and international competition. • Update the graduation projects' mechanism to pace with the KTH requirements and follow the Swedish educational quality; by acquiring the students with the necessary skills for writing a professional grad book and using various methods of investigations during the projects' stages.

		• Ensure cooperation with a number entrepreneur in supervising graduation projects alongside academic staff to achieve scientific and practical goals at the same time • Update program's teaching and learning strategies to include modern interactive techniques such as flipped classroom, self-learning, team-based learning, and blended learning (through Blackboard Platform). • Offer graduation projects in the fields of Artificial Intelligence (AI), Internet of Things (IoT)and smart systems • Provide summer training opportunities for the students related to the discipline and contemporary engineering problems in society. • Motivate the graduation projects' students to publish their researches in conferences and journals especially the projects which address social and industrial problems.

A.5. Practice research techniques and **methods of investigation as an inherent part of learning.**	EE 400-1: Graduation Project (1) + EE 400-2: Graduation Project (2)	• Encourage the graduation projects' students to participate in the national and international competition. • Update the graduation projects' mechanism to pace with the KTH requirements and follow the Swedish educational quality; by acquiring the students with the necessary skills for writing a professional grad book and using various methods of investigations during the projects' stages. • Motivate the graduation projects' students to publish their researches in conferences and journals especially the projects which address social and industrial problems. •
A.7. **Function efficiently** as an individual and **as a member of** multi-disciplinary and **multi-cultural teams.**	EE 400-1: Graduation Project (1) + EE 400-2: Graduation Project (2)	• Ensure cooperation with a number entrepreneur in supervising graduation projects alongside academic staff to achieve scientific and practical goals at the same time.
A.10. Acquire and apply new knowledge; and **practice** self, lifelong and **other learning strategies.**	All Courses	Update program's teaching and learning strategies to include modern interactive techniques such as flipped classroom, self-learning, team-based learning, and blended learning (through Blackboard Platform).

C.4. Use appropriate specialized software packages, write computer programs, use relevant laboratory equipment for the analysis and design of systems, Design, Select, and **apply Artificial Intelligence based solution**s	EC383: Intelligent Systems + EE 400-1: Graduation Project (1) + EE 400-2: Graduation Project (2)	Offer graduation projects in the fields of Artificial Intelligence (AI), Internet of Things (IoT) and smart systems.

II- Graduate Attributes

N.B: Gaps in graduate attributes are Underlined

Graduates Attributes Containing Gap	Bylaw Containing Gap	Action Plan
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and **demonstrate the capacity to engage in post- graduate and research studies.**	Bylaw of post-graduate studies has not been offered yet	Offer post-graduate studies programs.

Table (5): Action Plans in the Courses

No.	Course Code	Course Title	Teaching & Learning Methods	Assessment Methods	Area of development	Timing of development
1	All Courses		Flipped Classroom, Self-Learning, Team-Based Learning, and Blended Learning (through Blackboard Platform)		• Update course specifications for some course to add sustainability and development topics and link them with the 17 Goals of Sustainable Development Goals founded by the United Nations (UN). • Update courses' teaching and learning strategies to include modern interactive techniques such as flipped classroom, self-learning, learning, team-based learning, and blended learning (through Blackboard Platform).	Academic Year 2024/2025
2	EE 400-1 & EE 400-2	Graduation Project (1) & (2)	Projects, Lectures, Simulation, Laboratory Sessions, Brain Storming, Group Discussions, Self- Learning, Presentations, Reports, Case Studies, Flipped Classrooms, and Team-Based Learning	Graduation Projects [Semester Work (including reports, presentations and practical phase), Thesis Writing, and Final Thesis Defense]	• Offer graduation projects in the fields linked to the Egyptian National Strategy for Science, Technology and Innovation 2030. • Encourage the graduation projects' students to participate in the national and international competition. • Update the graduation projects' mechanism to pace with the KTH requirements and follow the Swedish educational quality; by acquiring the students with the necessary skills for	Academic Year 2024/2025

					writing a professional grad book and using various methods of investigations during the projects' stages. • Ensure cooperation with a number entrepreneur in supervising graduation projects alongside academic staff to achieve scientific and practical goals at the same time • Offer graduation projects in the fields of Artificial Intelligence (AI), Internet of Things (IoT)and smart systems • Motivate the graduation projects' students to publish their researches in conferences and journals especially the projects which address social and industrial problems.	
3		Field Training	Lectures,Presentations, Reports	Training Identity's Evaluation (استمارة ت٥), Internal Evaluation from the Supervisor (استمارة ت٦), and After Training presentation (استمارة ت٧)	Provide summer field training opportunities for the students related to the discipline and contemporary engineering problems in society.	Academic Year 2024/2025