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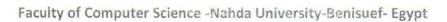
Program Specification Committee

PREPARED FOR Quality Assurance Unit

12/24/2023

Program Specifications

Computer Science







Program Name:	Computer Science
Program Code:	CS
Department:	Computer Science
College:	Faculty of Computer Science
Institution:	NAHDA University, Beni Sweif





Contents

Prog	ran	n Specifications
A.	E	Basic Information
В.	F	Professional Information 4
	1.	Program Aims
	2. 0	Graduate attributes
	3.	Intended Learning Outcomes (ILOs)
	b.	Intellectual Skills
	4.	Academic standards9
	5.	Curriculum Structure and Contents9
	6.	Program Courses
	7.	Contents of Courses
	8.	Program Admission Requirements
	9.	Regulations for progression and program completion
	10.	Student Assessment (Methods and rules for student assessment)
	11.	Program Evaluation
CS Pi	rogi	ram Matrices
1.	1	Academic Standards Matrix
2.	F	Program Matrix I (Courses – NARS General)
	3.	Program Matrix II (Courses – NARS Special)
	4.	Program Matrix III (Courses - Knowledge and Understanding Skills)17
	5.	Program Matrix IV (Courses - Intellectual Skills)





. 6	ō.	Program Matrix V (Courses - Professional and Practical Skills)	18
7	7.	Program Matrix VI (Courses – Transferable Skills)	18
8	3.	Program Matrix VII (Aims – ILOs)	18
9	9.	Teaching and Learning Methods Matrix VIII (ILOs-Teaching and Learning Methods)	18
1	LO.	Assessment Methods Matrix VIIII (ILOs-Assessment Methods)	18
Aca	ade	mic Standards (Intellectual Skills)	21
1	Aca	ademic Standards (Professional and Practical Skills)	23
Aca	ade	mic Standards (Transferable Skills)	24
Aca	ade	mic Standards Matrix	26
(CS F	Program Courses	28
F	ro	gram Matrix I (Courses – NARS General)	30
F	ro	gram Matrix IV (Courses - Intellectual Skills)	38
F	ro	gram Matrix (Courses - Professional and Practical Skills)	41
F	ro	gram Matrix VI (Courses - Transferable Skills)	44
	Pro	gram Matrix VII (Aims - II Os)	47



Program Specifications

A. Basic Information

1. Program Title: Computer Science

2. Program Type: Single

3. Faculty (Faculties): Faculty of Computer science.

4. Department: Computer Science

5. Coordinator: Dr. Saeed Khodary Hamouda

6. Last date of program specifications approval:

7. a-Department Council Date Approval:

b- Faculty Council Date Approval:

B. Professional Information

1. Program Aims

The program aims to provide the student with both breadth and depth of knowledge in the concepts and techniques related to the design, programming, and application of computing systems. Specifically, based on the constitutions of the Computing Curricula (ACM/IEEE CS2001 and CS2008) out CS program aims to provide the student with:

System-level perspective.

The objectives associated with individual units in the body of knowledge tend to emphasize isolated concepts and skills that can lead to a fragmented view of the discipline. Graduates of a computer science program must develop a high-level understanding of systems as a whole. This understanding must transcend the implementation details of the various components to encompass an appreciation for the structure of computer systems and the processes involved in their construction and analysis.

II. Appreciation of the interplay between theory and practice.

A fundamental aspect of computer science is the balance between theory and practice and the essential link between them. Graduates of a computer science program must understand not only the theoretical underpinnings of the discipline but also how that theory influences practice.



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III. Familiarity with common themes and principles.

In the course of an undergraduate program in computer science, students will encounter many recurring themes such as abstraction, complexity, and evolutionary change. They will also encounter principles, e.g. those associated with caching, (e.g. the principle of locality), with sharing a common resource, with security, with concurrency, and so on. Graduates should recognize that these themes and principles have broad application to the field of computer science and must not compartmentalize them as relevant only to the domains in which they were introduced.

IV. Significant project experience.

To ensure that graduates can successfully apply the knowledge they have gained, all students in computer science programs must be involved in at least one substantial software project. Such a project (usually positioned late in a program of study) demonstrates the practical application of principles learned in different courses and forces students to integrate material learned at different stages of the curriculum. Student need to appreciate the need for domain knowledge for certain applications, and that this may necessitate study within that domain.

V. Attention to rigorous thinking.

This may be formal but need not be but should include discipline epitomized by the use of sound practices which include planning, tracking progress, measuring and generally managing quality; these needs to be seen to complement sound design and sound choice of techniques.

VI. Adaptability

One of the essential characteristics of computer science over its relatively brief history has been an enormous pace of change. Graduates of a computer science program must possess a solid foundation that allows and encourages them to maintain their skills as the field evolves.

2. Graduate attributes

The Computer Science program is designed to provide the student with the foundations of the discipline as well as the opportunity for specialization. After successfully completing the Computer Science program, the graduate should be able to:

- I. Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and software-based systems.
- II. Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design, implementation, evaluation and evolution of computer-based systems.
- III. Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data.





- IV. Demonstrate the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic approaches.
- V. Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique.
- VI. Understand and apply a wide range of principles and tools of natural language processing and data mining.
- VII. Have a solid understanding of the used concepts in computer science to be able to pursue further learning, whether as graduate students or on their own.
- VIII. Demonstrate an understanding of algorithms and data structures, computer organization and architecture, programming language concepts, compilers, networks, artificial intelligence, graphics, human computer interfaces, and databases, and identify and define the computing requirements for its solution.
- IX. Design, implement, and evaluate a computer-based systems, process, component or program.
- X. Use knowledge and understanding in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoff involved in design choices.
 - Intended Learning Outcomes (ILOs)

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

- a1. Identify the essential mathematics relevant to computer science.
- a2. Explain code written in high-level programming languages.
- a3. Define the basic knowledge to the core of mathematical analysis.
- **a4.** Demonstrate basic knowledge and understanding of a core of statistics.
- a5. Interpret and analyze data qualitatively and/or quantitatively
- **a6.** Describe the principles and techniques of a number of application areas informed by the research directions of computer science.
- a7 Show a critical understanding of the principles of artificial intelligence, image, and pattern recognition.
- a8. Define the fundamental topics in computer systems, including hardware architectures and operating systems.
- **a9.** Identify the fundamental topics in computer science, including software architectures, software engineering principles and methodologies, and software tools.
- State advanced topics to provide a deeper understanding of some aspects of the hardware systems design, operating systems, computer security and compiler theory.
- **a11.** Discuss advanced topics to provide a deeper understanding of some aspects of object-oriented analysis and design, and software engineering.





- a12. Identify advanced topics to provide a deeper understanding of some aspects of the artificial intelligence, image processing, and computer graphics and animation.
- **a13.** Characterize strong knowledge of fundamentals of programming and the construction of computer-based systems.
- **a14.** Outline strong knowledge of fundamentals of data structures and algorithms.
- Describe a critical understanding of the broad context within computing including critical factors such as quality, reliability, enterprise, employment law and accounting.
- a16. Provide a deeper understanding of legal, professional and moral aspects of the exploitation of computing.
- a17. Outline the knowledge of tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.
- a18. Identify and assess criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.
- **a19.** Define the current and underlying technologies that support computer processing and inter-computer communication.
- **a20.** State the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. Formulate traditional and nontraditional problems, set goals towards solving them, and observe results.
- b2. Categorize different algorithms, methods, and techniques.
- b3 Analysis different (data, results, methods, techniques, and algorithms.
- **b4**. Identify attributes, components, relationships, patterns, main ideas, and errors.
- b5. Conclude the result of the proposed solutions.
- **b6**. Assesses solution methodologies upon their results.
- b7. Compose criteria, and verify solutions.
- **b8**. Underline a range of solutions and critically evaluate and validate proposed design solutions.
- b9. Solve computer science problems with pressing commercial or industrial constraints.
- b10 Initiate an innovative design to solve a problem containing a range of commercial and industrial constraints.
- **b11**. Formulate and model computer systems at different and appropriate levels of abstraction.
- b12. Construct designs to satisfy given requirements (synthesis, evaluation, application).





- b13. Estimate and evaluate a range of options in producing a solution to an identified problem
- b14. Analyze problem from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).
- **b15**. Outline the concepts, principles, theories and practices underpinning computing as an academic discipline.
- **b16**. Develop and assess criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof.
- **b17**. Develop ideas, proposals and designs effectively using rational and reasoned arguments for presentation. to a range of audiences
- **b18**. Select the results of tests to investigate the functionality of computer systems.

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. Use appropriate programming languages and design methodologies.
- c2. Select appropriate web-based systems, tools and design methodologies.
- c3. Utilize appropriate database systems.
- **c4.** Perform independent information acquisition and management, using the scientific literature and Web sources.
- c5. Specify, design, and implement computer-based systems.
- **c6.** Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
- c7. Illustrate the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.
- C8. Demonstrate the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems
- c9. Identify any risks or safety aspects that may be involved in the operation of computing equipment within a given context.
- c10. Select effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
- c11 Use effective use of general computing facilities effectively, plan and manage a project to complete within budget and schedule.
- **c12.** Demonstrate and manage the need for continuing professional development in recognition of the need for lifelong learning.
- c13. Discuss and Perform professional, moral and ethical issues within the discipline.
- c14. Operate computing equipment efficiently, considering its logical and physical properties.
- c15 . Use investigative skills to research new and novel aspects of their work.
- c16. Utilize tools and techniques for the design and development of applications.





d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. Communicate effectively by oral, written and visual means.
- d2. Work effectively as an individual and as a member of a team.
- d3. Collaborate effectively within multidisciplinary team.
- d4. Work in stressful environment and within constraints.
- d5. Prepare and present seminars to a professional standard.
- **d6.** Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy.
- d7. Demonstrate efficient IT capabilities.
- d8. Lead and motivate individuals.
- **d9.** Manage tasks and resources within the available resources via teams.
- d10 . Search for information and adopt life-long self-learning.
- **d11**. Acquire entrepreneurial skills.
- d12. Manage one's own learning and development.
- d13. Prepare their work in the form of reports.
- d14. Communicate effectively with team members, managers and costumers.
- d15. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.
- d16. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material

Academic standards

a. External references for standards

The academic standards invoked in this specification are driven based on the National Academic Reference Standards (NARS) for "Computing" approved by the National Authority of Quality Assurance and Accreditation of Education on October 2010.

b- Comparison of provision to external references See

the attached document "Program Matrices".

- c- Benchmark: Academic Standards NARS (October 2010) Computer Sciences
 - Curriculum Structure and Contents
 - a. Program duration: 146 credit hours- 4 levels.
 - b. Program structure
 - No. of program Levels (in credit-hours system): 4 levels. According to the following table.

Table 1. Summarizes the program structure.

Subject Area	Credit Hours	CS Program %	Tolerance
Humanities, Ethical and Social Sciences (University Requirement)	14	9.58 %	8-10 %





Mathematics and Basic Sciences (Institutional Requirement.)	21	14.38 %	16-18 %
Basic Computing Sciences (Institutional Requirement.)	51	34.93 %	26-28 %
Applied Computing Sciences (Program Major Requirement)	39	26.71 %	28-30 %
Projects and Training (Program Major Requirement)	6	4.1%	6-10 %
Subtotal	131	89.72 %	84-96%
Elective (Program Second Major Requirement)	15	10.27 %	4 -16%
Total	146	100 %	100 %

6. Program Courses

a. Compulsory Courses

Course	Course name	Prerequisites	Credit	ho	No. o urs/w		Program ILOS Covered (by No.)						
Code				Lect.	Lab	Exer.	a's	b's	c's	d's			
ENG111	English-1	-	1	2	-	_	-	4,14	4,10,12	1,3,6,10,12,13			
ENG112	English-2	7	1	1	-	=	1- 2,15,16	1-2	1-2,13	1-4			
ENG113	English-3	-	2	2	-	-	1-5	1-4	1-5	1-2			
HUM101	Human Rights	-	3	2	-	-	1,2,15,16	1-3	1-3,13	1-7			
REM101	Scientific Thinking	HUM111	3	2	-	-	1-3	1-3	1-3	1-9			
ETS101	Professional Ethics		1	1	-	-	1- 2,15,16	1-3	1-3,13	1-9			
MGT101	Principles of general management		3		-	-	1- 2,15,16	1-3	1-3,13	1-9			

T	able3. Mathematics and	Basic Sciences (I	nstitutio	nal Re	quiren	ent.) To	otal 21	Credit	Hrs	
Course	Course name	Prerequisites	Credit		f hours	/week	Program ILOS Cover (by No.)			
Code	1 12	•		Lect.	Lab	Exer.	a's	b's	c's	d's
MT101	Mathematics – 1	-	3	3	-	2	1,2	1,6	1-3	1-3
MT111	Mathematics – 2	MATH101	3	3	-	2	1-5	1-6	1-4	1-3





MT201	Mathematics – 3	MATH102	3	2	2 HT	-	1,2,5	1-6	1-4	1-3
MT211	Mathematics – 4	MATH102	3	3	-	2	1,2	1-6	1-4	1-4
MT301	Statistics & Probabilities-1	-	3	2	2 Hs	-	1-6	1-4	1-6	1-6
MT311	Statistics & Probabilities-2	-	3	2	2 Hs	-	1-5,7	1-4	1-5	1-6
PH101	Physics	120	3	2	2 Hs	_	1-5	1-6	1-5	1-6

Course Code	Course name	Prerequisites	Credit	No.	of hours	s/week	Pro	ogram ILOS (by	Cover No.)	ed
Code				Lect.	Lab	Exer.	a's	b's	c's	d's
CS101	IT Essentials	-	3	2	2Нт	-	1-7,11-14	1-5	1-3	1-5
CS112	Computer Language-1	CS101	3	2	2Нт	-	1-5	1,2,10,11	1-6	1-6
CS113	Data Structure	CS101	3	2	2 Нт	-	1-4	1-5	1,2	1-6
CS114	Operations Research	MT101	3	2	2 H _T		1-3,5-8	1-5	1-5	1,2
CS202	Logic Design – 1	-	3	2	2 Нт		_	5, 6	-	8
CS203	Analysis & Design of Algorithms	CS113	3	2	2Нт		1-7	1-6,8	1-6	1-8
CS205	Computer Architecture and Organization	CS101	3	- 2	2 Нт	2	1-10 ,17,20	1-3 ,6,9,10, 12,14-18	1-6,	16,14- 16
CS214	Computer Peripherals	CS101	2	2	2Нт	-	1-7	1-5	1-6	3,5, 6,1,4
CS215	Operating System – 1	CS101	3	2	2 H _T		1-6,8,9	1-3	1-4	1-4
CS216	File Organization	CS205	3	2	2Нт	2	1-4,6-7,19	1-6	1-5	1-6
CS308	Graph Theory in computer science	MT201	3	2.	2Нт		1-10,19	1-15	1-6	1-6
CS312	Computer Language-2	CS112	3	2	2Нт		1-8,18,19	1-5	1-3	1-4
IT301	Introduction to Web technologies	CS101	3	2	2Нт		1-8,18,19	1-5	1-3	1-4





Table5. Applied Computing Sciences (Program Major Requirement)Total 33 Credit Hrs

CS212	Logic Design – 2	CS202	3	2	2Нт	1-8,18,19	1-5	1-3	1-4
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					No. of	f	Progra	m ILOS	Covere	d (by
Course Code	Course name	Prerequisites	Credit	ho	urs/w	eek		No	.)	
Code				Lect.	Lab	Exer.	a's	b's	c's	d's
		3rd Level (Courses							
CS311	Assembly Language	CS211	3	2	2 H _T	2	1-5	2-11	1- 7,14- 16	1-6
CS321	Image Processing	CE221	3	2	2Нт	-	1-8	1-5	1-5	1,2
CS342	Computer Networks -1	CS141, CS201	3	2	2 Нт	2,18	1-5	1-5	1-5	1- 3,5
CS351	Multimedia	IT101, CS201	3	2	2Нт	Ψ,	1-7	1,3,5 ,6,8	1-4	1- 6,8
CS352	Software Engineering – 1	CS211	3	2	2Нт	-	1-8	1-6	1-5	1-6
CS361	Computer Networks -2	IT101, CS201	3	2	2Нт	-	1-6	1-8	1-6	1-8
CS381	Logic Programming	CS211, CS391	3	2	2Нт	-	1-10	1-15	1-6	1-6
		4th Level (Courses							
CS401	ES Development	CS313	3	2	2 H _T	-	1-9	1-5	1-4	1-4
CS402	Operating System – 2	CS215	3	2	2 Нт	-	1-6	3-6	1-4	1-4
CS411	Object Oriented Programming	CS113	3	2	2 Нт		1-6	1-8	1-6	1-8
CS314	Software Engineering – 2	CS304	3	2	2Нт		1-6	1-8	1-6	1-8





Т	able6. Mathematics	and Basic Sci	ences (Institu	utional	Rec	uirem	ent.) Student	Sel	lect 10	Cre	dit H	rs.								
Course Code	Course	name	Prerequisite	es Cre	edit	ho	No. urs/	of 'week	P	rograr	n IL	OS Co No.)	overed (by								
Code			-			Lect.	Lal	ab Exer.		a's	b's c's		d's								
HUM205	Scientific & Technic writing	al Report	-	4		3	2H	r -		1,2	1-3	3 1-3	3 1-7								
ST205	Statistical Methods	3	MT311	4		3	2H	r		1,2	1-3	3 1-3	3 1-7								
CS303	Communication Syst	tems	CS212	3	3	3	2H r	I 2		1-3	1-6	5 1-7	7 1-7								
IT308	Problem Solving Tec	chniques	CS203	3	3	3	4 H		1,2,3, 4-7,9 1-			4 1-3	3 1-5								
DS409	Decision and Game	Theory	CS114	3	3	3	2 H			2,3,47, 8,9	1	4 1-3	3 1-5								
	Table7. Applied	Computing S	ciences (Pro	gram N	Majo	r Requ	iren	nent) Stu	den	t Sele	ct 9	Credi	t Hrs.								
Course	Course name	Prerequisites	Credit	ho	No.	of week		Progr	am Ì	ILOS (Cov	ered (l	oy No.)								
Code		1		Lect.	Lak	Exe	r. a	ı's		b's		c's	d's								
CS309	Advanced Computer Organization	CS205	3	2	2 H			1-6 1		1-6		1-6		1-6		1-6		1-5		1-5	1-6
CS407	Computer Arabization	CS314	3	2	2 H			1-8	1-11		-8 1-11		L	1-6,8	1,3,4-7						
CS412	Knowledge Base Systems	CS401	3	2	2 H	r		2,8	2,4,8		2,4,8		3	1,5,7, 9,14	1,2,4, 8,9,11						
CS413	Neural Networks	CS313	3	2	2 H			3,5,6,9 11,13,15,17,20				1,2, 4-8, 12,14		5,6,9	2,3,4,6, 8-10, 13,14						
IS303	Database Systems	CS101	3	2	2 H	F- 1		1-8		1-3		1-5	1-7								
	Table8. Electi	ve (Program S	econd Major	Requ	irem	ent) St	ude	nt Select	15 (Credit	Hrs	3.	pd " es								
Course	Course name	Prerequisites	Credit	ho	No.	of week		Progr	am I	ILOS (Cove	ered (l	oy No.)								
Code		1		Lect.	Lat		r. a	ı's		b's		c's	d's								
IS312	Data Mining	IS303	3	2	2 H ³			1-6		1-5		1-5	1-6								
IT314	Computer Organization	CS312	3	2	2 H			1-6		1-5		1-5	1-6								
IT401	Computer Animation	CS101	3	2	2 H			1-6		1-5		1-5	1-6								
IT403	Multimedia	CS101	3	2	2 H			1-6		1-5		1-5	1-6								





IT404	Computer Graphics	MT211	3	2	2 H ^T	1-6	1-5	1-5	1-6
IT411	Pattern Recognition	MT311	3	2	2 H ^T	1-6	1-5	1-5	1-6
IT412	Artificial Intelligence	CS113	3	2	2 H ^T	1-6	1-5	1-5	1-6

7. Contents of Courses Syllabus: See the below

8. Program Admission Requirements

The Department of Computer Science offers admission to candidates holding the Egyptian General Secondary Certificate (science or math. major) or its equivalent, in adherence to the regulations and criteria established by the Supreme Council of Universities and the Council of Private and National Universities.

9. Regulations for progression and program completion

Please, refer to the faculty bylaw (Curriculum of Undergraduate Programs), 2010 pages 3-5.

- The attainment of a bachelor's degree requires the successful completion of 146 credit hours, adhering to the university, faculty, program major, and second major requirements, along with maintaining a cumulative GPA greater than or equal to 2. Refer to section (page 4) for compulsory and elective categories associated with each requirement.
- The successful completion of an eight-week field training program in sites relevant to the field of computer science is also a requisite for obtaining the bachelor's degree.
- English is the designated language of instruction at the faculty and the program. Examinations are also conducted in English. In exceptional circumstances, the dean of the faculty may grant permission for a student to respond in an alternative language, following consultation with the student's academic advisor.
- Students are eligible to enroll in a specific number of credit hours during both the Fall and Spring semesters based on their cumulative GPA, as outlined in the following table:

Table9. Grading scheme

Cumulative GPA	Allowed Credit Hours
Cumulative GPA ≥ 2	18
2 > Cumulative GPA ≥ 1.75	15
1.75 > Cumulative GPA ≥ 1.5	12
Cumulative GPA < 1.5	9





- Students meeting the criterion of maintaining a cumulative GPA exceeding 3.3 or those
 necessitating additional credit hours for graduation are permitted to enroll in an extra
 three credit hours during both the Fall and Spring semesters.
- Students have the opportunity to register for a maximum of nine credit hours during a summer semester, with the option to add an additional three hours if required for meeting graduation criteria.
- Upon the approval of the academic advisor, students have the ability to adjust, including
 adding or dropping one or more courses, within the initial two weeks of the semester,
 while considering the maximum allowable credit hours for that semester.
- Upon obtaining approval from the academic advisor, students have the option to withdraw from and exclude a course from their academic record before the conclusion of the fourth week, while considering the minimum allowable number of registered credit hours.
- Subject to approval from the faculty council, students may choose to withdraw from a
 course with a "WITHDRAW" grade from the fourth to the twelfth week, considering the
 minimum allowable number of registered credit hours.
- A student will be subject to academic monitoring if their cumulative GPA falls below 2.

Table 10. Requirements for Student's Transfer between Different Levels

Percentage required to pa next	ass from level to	Situation	Level
Less than or equal	More than		
0 Hour	36 Hour	Freshman	100
36 Hour	72 Hour	Sophomore	200
72 Hour	108 Hour	Junior	300
108 Hour	146 Hour	Senior	400

10. Student Assessment

Table 11. Methods and Rules for Student Assessments

Method (tool)	Intended leaning outcomes assessed	Time
1- Written examinations	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills	Final exam at the end of the semester /quizzes all over the semester
2- Oral examination	Knowledge and Understanding - Intellectual Skills	At the end of the semester
3- Laboratory examination	Professional Skills - General Skills	all over the semester
4- Graduation project	Professional Skills - General Skills	Senior Student's Graduation
5- Reports and homework	Knowledge and understanding	During the Semester



11. Program Evaluation

Table 12. Program Evaluation Criteria

Evaluator	Tool	Sample
1- Senior students	Questionnaires	25%
2- Alumni	Questionnaires	25%
3- Stakeholders	Questionnaires, Joint Discussion	Some of the Employers
4-External Evaluator(s) (External Examiner(s))	Review Reports	1 Report
5- (Internal reviewer)	Reports	1 Report

12. Teaching and learning method

Table 13. Teaching and Learning Methods

	Teaching / Learning Method	
Lecture		
Tutorials exercises		
Practical exercises		
Workshops	X X	
Projects		
Case study		

CS Program Matrices

The main description of Computer Science Program can be summarized in different types of matrices. These matrices are:

- Academic Standards Matrix
 This matrix shows the ILOs invoked in CS Program Specifications and those existing in NARS and the corresponding between them.
- Program Matrix I (Courses NARS General)
 This matrix shows how CS Program Courses can cover the NARS general ILOs.
- Program Matrix II (Courses NARS Special)
 This matrix shows how CS Program Courses can cover the NARS special ILOs.
- 4. Program Matrix III (Courses Knowledge and Understanding Skills)
 This matrix shows how CS Program Courses can cover Knowledge and
 Understanding Skills invoked in CS Program Specifications.







- Program Matrix IV (Courses Intellectual Skills)
 This matrix shows how CS Program Courses can cover Intellectual Skills invoked in CS Program Specifications.
- Program Matrix V (Courses Professional and Practical Skills)
 This matrix shows how CS Program Courses can cover Professional and Practical Skills invoked in CS Program Specifications.
- Program Matrix VI (Courses Transferable Skills)
 This matrix shows how CS Program Courses can cover Transferable Skills invoked in CS Program Specifications.
- 8. Program Matrix VII (Aims ILOs)
 This matrix shows how CS Program ILOs can cover the program aims.
- 9. Teaching and Learning Methods Matrix VIII (ILOs-Teaching and Learning Methods) This matrix shows what teaching methods are covered by CS Program ILOs.
- 10. Assessment Methods Matrix VIIII (ILOs-Assessment Methods)
 This matrix shows what assessment methods are covered by CS Program ILOs

Academic Standards (Knowledge and Understanding Skills) (October2010) Computer Sciences.



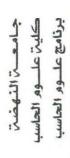




Table 14. Academic Standards (Knowledge and Understanding Skills) (October 2010) Computer Sciences

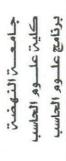
	CS Program ILOs	Corresponding in NARS	nding in RS	NARS ILOs - General	NARS ILOs - Special
		General	Special		
a1.	a1. Recognize the essential mathematics relevant to computer science.		A1	K1. Essential facts, concepts, principles and theories relating to computing and	A1. Understand the essential mathematics relevant to computer
a2.	a2. Explain code written in high-level programming languages.		A2	information and computer applications as appropriate to the program of study.	Science.
а3.	a3. Demonstrate basic knowledge and understanding of a core of mathematical analysis.	K4	A3	K2. Modeling and design of computer- based systems bearing in mind the trade- offs. K3. Tools practices and methodologies	ges. nstrate basic k
a4.	a4. Demonstrate basic knowledge and understanding of a core of statistics	7 Α	A3	used in the specification, design, implementation and evaluation of	understanding of a core of analysis, algebra, applied mathematics and statistics.
a5.	a5. Interpret and analyze data qualitatively and/or quantitatively.		A4	computer software systems. K4. Criteria and specifications appropriate	A4. Interpreting and analyzing data qualitatively and/or quantitatively.
а6.	a6. Describe the principles and techniques of a number of application areas informed by the research directions of computer science.	K5	A5	to specific problems, and plan strategies for their solution. K5. The extent to which a computer-based system meets the criteria defined	A5. Know and understand the principles and techniques of a number of application areas
a7.	a7. Show a critical understanding of the principles of artificial intelligence, image, and pattern recognition.	Σ	A6	for its current use and future development. K6. The current and underlying	informed by the research directions of the subject, such as artificial intelligence, databases and
а8.	a8. Define the fundamental topics in computer systems, including hardware architectures and operating systems.	Z	A7	technologies that support computer processing and inter-computer communication.	computer graphics. A6. Show a critical understanding of
a9.	a9. Define of fundamental topics in computer science, including software architectures, software engineering principles and methodologies, and software tools.	Ξ	Α7	investigate the functionality of computer programs and computer systems and evaluating their results. K8. Management and economics	ge, and of func





a10. Define advanced topics to provide a deeper understanding of some aspects of the hardware systems design, operating systems, computer security and compiler theory.		A8	principles relevant to computing and information disciplines. K9. Professional, moral and ethical issues involved in the exploitation of computer	topics in Computer Science, including hardware and software architectures, software engineering principles and methodologies, operating systems and software
a11. Discuss advanced topics to provide a deeper understanding of some aspects of object-oriented analysis and design, and software engineering.		A8	rechnology and be guided by the appropriate professional, ethical and legal Practices relevant to the computing and	anced top inderstandi
a12.Identify advanced topics to provide a deeper understanding of some aspects of the artificial intelligence, image processing, and computer graphics and animation.		A8	information industry. K10. Current developments in computing and information research. K11. Requirements, practical constraints	hardware systems design, object- oriented analysis and design, and artificial intelligence, and parallel and concurrent computing
a13. Characterize strong knowledge of fundamentals of programming and the construction of computer-based systems.	К8		and computer-based systems.	
a14.Outline strong knowledge of fundamentals of data structures and algorithms.	K1	1 .		
a15.Describe a critical understanding of the broad context within computing including critical factors such as quality, reliability, enterprise, employment law and accounting.	K8			
a16.Provide a deeper understanding of legal, professional and moral aspects of the exploitation of computing.	K8,K9			
a17. Outline the knowledge of tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.	K8,K9			







a18.Identity and assess criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.	3			
a19.Define the current and underlying technologies that support computer processing and inter-computer communication.	K5			
a20.State the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	K6			

Table 15. Academic Standards (Intellectual Skills)

in NARS in NARS	General Special	B1 II. Analyze a wide rang solutions related to	B2 of computing systematical	B3 appropriate methods	B4 academic discipline.	I3. Understand and ana B5 computer software s	B6 appropriateness of	B7 current deployment interpret the results	
	rado de la companya della companya della companya de la companya della companya d	of problems and provide B1. Defin he design and construction nontra		result:	ning computing as an between methods,	yze problems and evaluate B3. Perfor stems for their solution.	criteria to measure the techniques a computer system for its etc.).	and future evolution, and to B4. Identi hereof.	and the contract of the
0.00000	NAMS ILOS - General	TANKS ILOS - OCHERAL	II. Analyze a wide range of problems and provide B solutions related to the design and construction	Sp. 11. Analyze a wide range of problems and provide B1. solutions related to the design and construction of computing systems through suitable also rithms, structures, diagrams, and other	It. Analyze a wide range of problems and provide B1. solutions related to the design and construction of computing systems through suitable algorithms, structures, diagrams, and other appropriate methods.	Spanning computing systems through suitable algorithms, structures, diagrams, and other appropriate methods. 12. Apply the concepts, principles, theories and betwardenic discipline.	I. Analyze a wide range of problems and provide B1. solutions related to the design and construction of computing systems through suitable algorithms, structures, diagrams, and other appropriate methods. 12. Apply the concepts, principles, theories and B2. practices underpinning computing as an betwacademic discipline. 13. Understand and analyze problems and evaluate Computer software systems for their solution.	Spanning to the design and provide B1. 11. Analyze a wide range of problems and provide B1. solutions related to the design and construction of computing systems through suitable algorithms, structures, diagrams, and other appropriate methods. 12. Apply the concepts, principles, theories and B2. practices underpinning computing as an betwace academic discipline. 13. Understand and analyze problems and evaluate computer software systems for their solution. 14. Define and assess criteria to measure the appropriateness of a computer system for its etc.)	Spiral Analyze a wide range of problems and provide B1. solutions related to the design and construction of computing systems through suitable algorithms, structures, diagrams, and other appropriate methods. 12. Apply the concepts, principles, theories and B2. practices underpinning computing as an betwacedemic discipline. 13. Understand and analyze problems and evaluate computer software systems for their solution. 14. Define and assess criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to B4. interpret the results thereof.





by. Solve computer science problems with pressing commercial or industrial constraints. bl. Generate an innovative design to solve a problem containing a range of commercial and industrial constraints. bl. Pormulate and model computer systems at different and appropriate levels of abstraction. bl.2. Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application). bl.3. Analyze and evaluate a range of options in producing a solution to an identified problem. bl.4. Analyze problem from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis). bl.5. Outline the concepts, principles, theories and practices underpinning computing as an academic discipline. bl.6. Develop and assess criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof.	nercial or ntaining a rent and lution to		15. Analyze, propose and evaluate alternative computer systems and processes considering limitations, constraints, fit-for purpose, general quality, and possible tradeoffs within the parameters of the problem. 16. Synthesize ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences. 17. Generate and evaluate the results of tests to investigate the functionality of computer systems. 18. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.	main ideas, and errors. B 5. Summarize the proposed solutions and their results. B 6. Restrict solution their results. G 7. Establish criteria, and verify solutions. D 88. Identify a range of solutions and critically evaluate and justify solutions.
nercial or B9 ntaining a B10 rent and B10 13,18, 16 ution to 15 nents 11 sof a 14	ntaining a rent and lution to		computer systems and processes considering limitations, constraints, fit-for purpose, genera quality, and possible tradeoffs within the parameters of the problem. 16. Synthesize ideas, proposals and design effectively using rational and reasoned arguments for presentation to a range of audiences. 17. Generate and evaluate the results of tests to investigate the functionality of compute systems. 18. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability and environmental impact.	B5. Summarize the propsolutions and results. B6. Restrict solution methodologies uptheir results. B7. Establish criteria, verify solutions. B8. Identify a range solutions and criteral evaluate and proposed descriptions.
ntaining a B10 Interest and B10	rent and ution to		quality, and possible tradeoffs within the parameters of the problem. 16. Synthesize ideas, proposals and design effectively using rational and reasoned arguments for presentation to a range of audiences. 17. Generate and evaluate the results of tests to investigate the functionality of compute systems. 18. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability and environmental impact.	B6. Restrict solution methodologies uportheir results. B7. Establish criteria, verify solutions. B8. Identify a range solutions and criterian evaluate and proposed describitors.
rent and B10 13, 18, 16 ution to 15 15 11 12 16 11 17 18 19 19 10 10 10 10 10 10 10 10	rent and lution to	W-3 -	16. Synthesize ideas, proposals and design effectively using rational and reasoned arguments for presentation to a range of audiences. 17. Generate and evaluate the results of tests to investigate the functionality of compute systems. 18. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability and environmental impact.	methodologies uper their results. B7. Establish criteria, verify solutions. B8. Identify a range solutions and critering evaluate and proposed describitions.
13, 18, 16 16 17 18 18 18 11 11 12 12 12 14 14	ution to	ŕ	audiences. 17. Generate and evaluate the results of tests to investigate the functionality of compute systems. 18. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability and environmental impact.	B8. Identify a range solutions and crit evaluate and j proposed d
to 15 17 11 11 12 12 14	ð		gate the functionality of is. computing judgments ed costs, benefits, safety, qualivironmental impact.	solutions and creating evaluate and proposed
11 12 14	of and an all and an			B9.
12 ,			19. To be guided by the professional, legal, moral B10. Generate and ethical issues relevant to the computing innovative solve a industry.	70
			110. Read and evaluate research papers in a range of knowledge areas.	containing a range of commercial and industrial constraints.
b17. Create ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.				



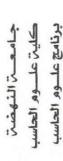


computer systems.

b18. Evaluate the results of tests to investigate the functionality of

Table16. Academic Standards (Professional and Practical Skills)	I and Pract	ical Skills		
CS Program ILOs	Corresponding in NARS	nding in	MADE II Oc. Conotol	MARS II Os - Special
	General	Special	IVANS ILOS - General	INDIA IFOS - SPECIAL
c1. Use appropriate programming languages and design methodologies.		C	P1. Operate computing equipment effectively, recognizing its logical and	C1. Use appropriate programming languages, web-based systems and
c2. Use appropriate web-based systems, tools and design methodologies.		C1	physical properties, capabilities and limitations.	tools, design methodologies, and database systems.
c3. Use appropriate database systems.		CI	P2. Effectively deploy computers	C2. Communicate effectively by oral, written and visual means.
c4. Perform independent information acquisition and management, using the scientific literature and Web sources.		C3	P3. Deploy effectively the knowledge and tools used for the construction and	C3. Perform independent information acquisition and management, using the scientific literature and Web sources.
c5. Specify, design, and implement computer-based systems.	P2	C7	5	C4. Prepare and present seminars to a
				C5. Perform independent information acquisition and management, using the
c6. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.		83		scientific literature and Web sources. C6. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature
c7. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.		63	P4. Work effectively individually, under direct supervision and/or as part of a team.	C7. Specify, design, and implement computer-based systems. C8. Evaluate systems in terms of general condity attributes and possible
c8. Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials		C10	P5. Use an appropriate mix of tools and aids in preparing and presenting reports	tradeoffs presented within th







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including user interfaces, web pages, and multimedia systems.		for a range of audiences, including management, technical, users or the	problem.
c9. Identify any risks or safety aspects that may be involved in the operation of computing equipment within a given context.	P7 C11	D 20	information management, information
c10. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.	P3 C12		skills to information of various kinds, including text, images, sound, and video.
c11. Make effective use of general computing facilities, plan and manage a project to complete within budget and schedule.	P1	aspects involved in the operation of computing equipment within a specific	C10. Apply the principles of human-computer interaction to the evaluation
c12. Appreciate and manage the need for continuing professional development in recognition of the need for lifelong learning.	C3	context.	and construction of a wide range of materials including user interfaces, web pages, and multimedia systems.
c13. Address and apply professional, moral and ethical issues within the discipline.	61		C11. Identify any risks or safety aspects
c14. Operate computing equipment efficiently, considering its logical and physical properties.	P1		of computing equipment within a
c15. Use investigative skills to research new and novel aspects of their work.	110		C12. Deploy effectively the tools used for
c16. Apply tools and techniques for the design and development of applications.	P2		the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
			C13. Prepare technical reports, and a dissertation, to a professional standard.

Table 17. Academic Standards (Transferable Skills)

	CS Program ILOS in NARS in NARS ILOS - General NAKS ILOS - Spe



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	General Special	Special		
d1. Communicate effectively by oral, written and visual means.	9.L	C2	T1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.	
d2. Work effectively as an individual and as a member of a team.	T2		management and organizational skills.	
d3. Collaborate effectively within multidisciplinary team.	P4		T3. Show effective information-retrieval. T4. Work in stressful environment and within constraints,	
in stressful environment and within	T4, P4		cope with multiple tasks. T5. Exhibit appropriate numeracy skills in understanding	
d5. Prepare and present seminars to a professional standard.	P5	C4	and presenting cases involving a quantitative dimension. T6. Exhibits communication skills, public speaking and Presentation skills, and delegation, writing skills, oral	
do. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy.		92	delivery, and effectively using various media for a variety of audiences. T7. Display effective use of general computing facilities.	
d7. Demonstrate efficient IT capabilities.	T3, T7		18. Develop a range of fundamental research skills, through the use of online resources, technical	
d8. Lead and motivate individuals.			repositories and library-based material. T9. Demonstrate an appreciation of the need to continue	
d9. Manage tasks and resources.	T2		professional development in recognition of the requirement for Life Long Learning.	
d10. Search for information and adopt life-long self-learning.	T3, T9	C5		
d11. Acquire entrepreneurial skills.	P6			
d12. Manage one's own learning and development	T1, T9			
d13. Prepare their work in the form of reports	P5	C13		
d14. Communicate effectively with team members, managers and costumers.	9.L	C2		





T2	T8
d15. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.	d16. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material.
d15.	d16.

Matrix
Standards
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Table 18.

	Knowledge and Understanding Skills	derstanding Sk	IIIs
NARS ILOs General	Covering ILOs in CS Program	NARS ILOs Special	Covering ILOs in CS Program
K1	a7, a8, a9, a13, a14	A1	al
K2	a13	A2	a2
K3	a17	A3	a3, a4
K4	a3, a4	A4	a5
K5	a6, a18	A5	a6
К6	a19	A6	a7
К7	a20	A7	a8, a9
K8	a15	A8	a10, a11, a12

		Intellectual Skills	
NARS ILOs General	Covering ILOs in CS Program	NARS ILOs Special	Covering ILOs in CS Program
11	b14	B1	b1
12	b15	B2	b2
13	512	B3	b3
14	b16	B4	b4
15	b13	B5	b5
91	b17	B6	99
71	b18	B7	Ъ7
18	b12	B8	P8





Professional and Practical Skills Covering ILOs in Covering ILOs in CS Program NARS ILOs CS Program c11, c14 C1 c1, c2, c3 c5, c16 C2 d1, d14 c4, c12 c4, c12 d3 C4 d5 d41 C5 d10 c9 C6 d6 C7 c5 c6 C8 c6	61	c13	B9	P9
NARS ILOs Special C1 C2 C2 C3 C4 C6 C6 C6	110	c15	B10	b10
NARS ILOs Special C1 C2 C3 C4 C5 C6				ACOUNTY AND THE PROPERTY OF TH
2 2 2 2 2 2	ni	Transfer	Transferable skills	
CS C	NA	NARS ILOs General	Cove	Covering ILOs in CS Program
C5 C	SSEE AND TO STORE A	Т1		d12
2 2 2 2 2	ACONICO SISSERALIO	Т2		d2, d9
C7 C4		Т3		d7, d10
CS CS		T4		44
C7 C8		T5		d15
		9L		d1, d14
		T7		47
	000000000000000000000000000000000000000	T8		416



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Table 19. CS Program Courses

Course Code	English-1 Scientific Thinking Principles of general management Mathematics – 1 Physics -1	Level 3	Course Code	English-3 Assembly Language Image Processing Computer Networks -1 Multimedia
COLOT	II Essentials		CS304	Software Engineering 1



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CS212 Logic Design – 2 MT211 Mathematics – 4 CS308 Graph Theory in computer science

			Table 20. Elective Courses	e Courses	
	Course Code	Course Title		Course Code	Course Title
ə A	1S303	Database Systems	I A A	CS407	Computer Arabization
	CS309	Advanced Computer Organization		CS412	Knowledge Base Systems



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CS413 Neural Networks	17401 Computer Animation	IT403 Multimedia	TT404 Computer Graphics	IT411 Pattern Recognition	The state of the s
Data Mining	Computer Organization	Scientific & Technical Report writing	Statistical Methods	Communication system	Droblom Colving Techniques
IS312	IT314	HUM205	ST205	IT308	00230

Table 21. Program Matrix I (Courses - NARS General)

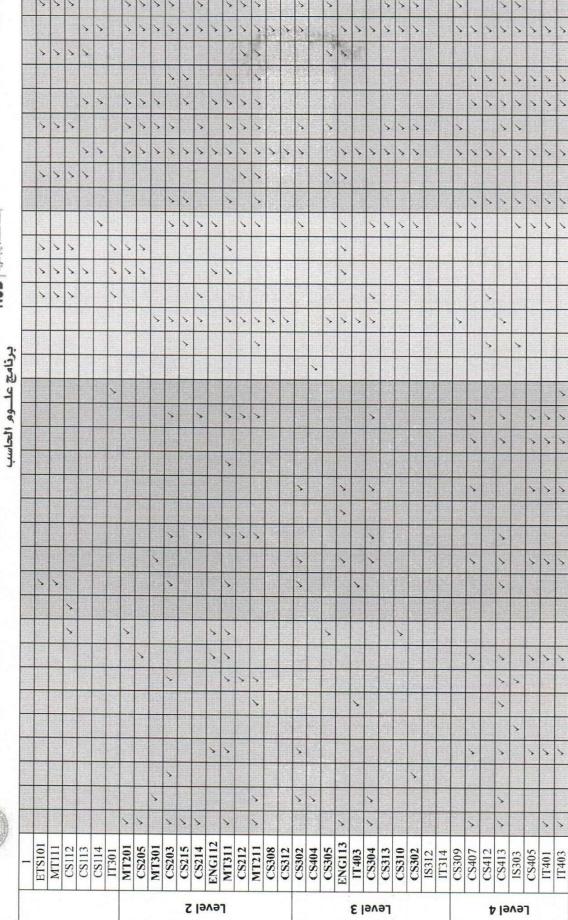
T9			-					
T8	1		1		>	1	>	1
4	>	>					>	>
T6					>	>	>	>
15	>						>	
T4								
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Course	REM101	MGT101	MT101	PH101	CS101	CS202	ENG111	HUM10
Level	Level 1							



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Table 22. Program Matrix II (Courses - NARS Special)

		I	[eve]		
Course	REM101	MGT101	MT101	PH101	CS101
A1	>	>	`	>	>
A2	>	>	>	>	>
A3	>	>		>	>
A1 A2 A3 A4 A5 A6	>	>		>	>
A6	>				
A7	>	>			
B1		>	\	>	>
B2	>	>		>	>
B3	`	>		>	>
B4	>			>	>
B5	>			>	
B6 B			>	>	
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Table23. Program Matrix III (Courses - Knowledge and Understanding Skills)

Level	Code	Course	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18	a19	a20
	ENG111	English-1	/	V																		
	REM101	Scientific Thinking	~	~	✓	~																
	MGT101	Principles of general management	~	~																		
	MT101	Mathematics – 1	√		1																	
	PH101	Physics -1	V																			
	CS101	IT Essentials		1						1	1											
1	CS202	Logic Design – 1	V		-					1	-								/			
Level 1	HUM101	Human Rights	V	V	1	~																
Lei	ETS101	Professional Ethics	V	~	V	V																
	MT111	Mathematics – 2	V		/																	
	CS112	Computer Language-1	V	~					~		~											
	CS113	Data Structure	V		V	~	V	1	1						V							
	CS114	Operations Research	V	~	1																	
	IT301	Introduction to Web technologies		~					~			~							√			
	ENG112	English-2	1	1																		
	MT201	Mathematics –	1	✓	1	~			=2	178			-									
	CS205	Computer Architecture and Organization								1		✓			/				/			
vel 2	MT301	Statistics & Probabilities-1			√	~	✓						✓									
Leve	CS203	Analysis & Design of Algorithms															V		√	/		
	CS215	Operating System – 1			V	~	1					V	V								~	
	CS214	Computer Peripherals	~		1											V					~	
	MT311	Statistics & Probabilities-2	~	~	√		✓				d e											
	CS212	Logic Design –	1	~						1				~								





Level	Code	Course	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18	a19	a20
		2						F										20				
	MT211	Mathematics – 4	~		V			~		1												
	CS308	Graph Theory						V	V	√												
		in computer	~		1												~	~				
		science																				
	CS312	Computer	\	1					~		1											
-	00010	Language-2		_		-	-									_						
	CS216	File	~				V	~	~													
		Organization												_	-							
	ENG113	English-3	√	V		_																
	CS302	Assembly Language	~	~	~																	
	CS404	Image Processing			~			~	~					1								
	CS305	Computer Networks -1	~								/		~									
	IT403	Multimedia													1							
1	CS304	Software																				
	03301	Engineering – 1									~		V									
	CS313	Computer																				
		Networks -2	V							1		1		~								
3	CS310	Logic										2										
Level 3		Programming									1	~										
Le	HUM205	Scientific &						1														
		Technical Report writing	V	~																		
	ST205	Statistical Methods	V			~																
	CS303	Communication system	√					/		1					~							
	IT308	Problem Solving Techniques													~	1						
	CS309	Advanced Computer Organization		~						V		~			~							
	IS303	Database Systems	V		1		~						1									
<u>.</u>	CS401	ES Development					~		~					~					~			
Level	CS402	Operating System – 2	V	✓	1	/																



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Level	Code	Course	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18	a19	a20
	CS405	project	V	V	1		V	1	1	~	✓	1	1	V	✓	1	V	V	✓	V	✓	✓
	CS411	Object Oriented Programming						/														~
	CS314	Software Engineering – 2						~			~		~		1							
	D409	Decision and game theory		~		~			√													
	CS407	Computer Arabization	V					/	1										√			
	CS412	Knowledge Base Systems	V				V															
	CS413	Neural Networks			V				/					1	1							
	IT401	Computer Animation							V	1				1								
	IT403	Multimedia										,			1							
	IT404	Computer Graphics - 1	V						~	~	V			~								
	IT411	Pattern Recognition							√					~								
	IT412	Artificial Intelligence	\	~	✓	~	✓	1			÷	~			1			V	~		~	
	IT314	Computer Organization								1		1			1				✓			

Table 24. Program Matrix IV (Courses - Intellectual Skills)

Level	Code	Course	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18
	ENG111	English-1	1		,=															
	REM101	Scientific Thinking	√	✓	~	✓														
	MGT101	Principles of general management	/					~	4 4 -											
11	MT101	Mathematics – 1	~	~						77						(45				
Level 1	PH101	Physics -1			~					/										
7	CS101	IT Essentials				V		1	/	1	1									
	CS202	Logic Design – 1	~		~			~			1									
	HUM101	Human Rights	/	/	~	/														
	ETS101	Professional Ethics	V	V	~	V										1				
	MT111	Mathematics -	/	/		-	/	4			100	14,5	2		-					1





Level	Code	Course	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18
		2																		
	CS112	Computer Language-1							V					V						
	CS113	Data Structure	/		1						V									
	CS114	Operations Research	✓		1			V												
	IT301	Introduction to Web technologies							V	V		✓				~				
	ENG112	English-2	1	1																
	MT201	Mathematics – 3	1	1	~	~														
	CS205	Computer Architecture and Organization		√	~			19190				F-	✓	√						
	MT301	Statistics & Probabilities-1				~	1		~									√		
	CS203	Analysis & Design of Algorithms																		✓
2	CS215	Operating System – 1	√	V	~						8									
Level 2	CS214	Computer Peripherals											√	V						
	MT311	Statistics & Probabilities-2	✓	√	~	V														
	CS212	Logic Design –	√			1														
	MT211	Mathematics – 4		1				1			1									
	CS308	Graph Theory in computer science		~		44)	1					1								
	CS312	Computer Language-2							√					~						
	CS216	File Organization			~				1											
Level 3	ENG113		✓																	
Lev	CS302	Assembly Language	✓	✓				~					✓			✓				





														سوم						
Level	Code	Course	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18
	C5404	Image Processing								7147		V		V						1
	CS305	Computer Networks -1			~			~						~						
	IT403	Multimedia												√	/					1
	CS304	Software Engineering – 1											V							
	CS313	Computer Networks -2			~			1												
	CS310	Logic Programming	✓	V																
	HUM205	Scientific & Technical Report writing	1	~	~							*								
	ST205	Statistical Methods						√	~											
	C303	Communication system		✓		√														
	IT308	Problem Solving Techniques	√	V																
	CS309	Advanced Computer Organization			~							~								~
	IS303	Database Systems	V			V	*			~										
	CS401	ES Development		1	~			1												
	CS402	Operating System – 2	\	V	~	V	\													
	CS405	project	/	~	~	✓	/	~	✓	/	1	. 1	~	1	1	1	1	1	1	V
Level 4	CS411	Object Oriented Programming			~		~			~	√									✓
	CS314	Software Engineering – 2				~	/					✓	V		V					
	D409	Decision and game theory					1			✓	- 3									
	CS407	Computer Arabization	V	V	~							ž.								
	CS412	Knowledge	✓	✓	~															





Level	Code	Course	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18
		Base Systems				-			4	10										
	CS413	Neural Networks	~	~				1					V		1	1		V		
	IT401	Computer Animation	V	1	√															11
	IT403	Multimedia												V	/					/
	IT404	Computer Graphics - 1	✓	V	~															
	IT411	Pattern Recognition		~		V														
	IT412	Artificial Intelligence	V	V		√	~	1			~	✓	√	V	✓	1	V		✓	V
	IT314	Computer Organization		~	~								✓	V						

Table25. Program Matrix (Courses - Professional and Practical Skills)

Level	Code	Course	c1	c2	с3	c4	c5	c6	c7	c8	с9	c10	c11	c12	c13	c14	c15	C16
	ENG111	English-1	/															
	REM101	Scientific Thinking	V	~	~	~			-									
	MGT101	Principles of general management	1	~	~													
	MT101	Mathematics – 1	/	1	1						30.52							
	PH101	Physics -1	V	✓			1											
	CS101	IT Essentials	V	V														
Level 1	CS202	Logic Design – 1	1	~					1		1 70							
Le	HUM101	Human Rights	V	V	/													
	ETS101	Professional Ethics	√	V	1													
	MT111	Mathematics –					13	1	_			1					1	
	CS112	Computer Language-1	V		~		√											
	CS113	Data Structure		/	1		V		/									
	CS114	Operations Research					✓		~									
	IT301	Introduction to	V	~		V				/								





								-			-	ושכווו	7.3		-,-			
		Web technologies						12										
	ENG112	English-2	V															
	MT201	Mathematics – 3	√	√	√	✓												
	CS205	Computer Architecture and Organization	✓				~									✓		
	MT301	Statistics & Probabilities-1	√	~	~		~											
	CS203	Analysis & Design of Algorithms											1				·	
7	CS215	Operating System – 1	V	✓	✓	1												
Level 2	CS214	Computer Peripherals							V							1		
	MT311	Statistics & Probabilities-2										V				1		
	CS212	Logic Design –	V		~		V								1			
	MT211	Mathematics - 4	✓		✓		1											
	CS308	Graph Theory in computer science									V	1		1	V			
	CS312	Computer Language-2	√		1		1											
	CS216	File Organization	√					~										
	ENG113		√	✓														
	CS302	Assembly Language	V	V	V													
Level 3	CS404	Image Processing				1				✓			✓					
L	CS305	Computer Networks -1			1				✓			1						
	IT403	Multimedia																✓
	CS304	Software Engineering –		V			1			1		1	V					





		1				3.9.5					4							
	CS313	Computer Networks -2			PRESE				1			~						
	CS310	Logic Programming	1				1											
	HUM205	Scientific & Technical Report writing	✓	✓														
	ST205	Statistical Methods					1					✓						
	C 303	Communication system	V				~		~									
	IT308	Problem Solving Techniques									√	1						
	CS309	Advanced Computer Organization										V		~	~			
	IS303	Database Systems			~	✓												
	CS401	ES Development					V		✓		1							
	CS402	Operating System – 2	√	1	1	1	1											
	CS405	project	✓	V	1	1	1	1	1	1	~	1	1	1	1	1	1	~
	CS411	Object Oriented Programming	V								V	I I BARES						,
	CS314	Software Engineering – 2	√	1		1			1							1		
Level 4	D409	Decision and game theory					1			1	7							
Le	CS407	Computer Arabization		1				~		1								
	CS412	Knowledge Base Systems	V	V	V	V												
	CS413	Neural Networks				✓						✓						
	IT401	Computer Animation		1		✓		~		✓								
	IT403	Multimedia																V
	IT404	Computer Graphics - 1	√				2.		1	7.	*	✓						
	IT411	Pattern						1										~





	Recognition													
IT412	Artificial Intelligence	V	V	\	1	1		1	V				1	
IT314	Computer Organization	~				√						1		

Table 26. Program Matrix VI (Courses - Transferable Skills)

Level	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d1 0	d1 1	d1 2	d1 3	d1 4	d1 5	d1
	ENG111	English-1	V															
	REM101	Scientific Thinking	~	√	~	1												
	MGT101	Principles of general management	V	✓	1													
	MT101	Mathematics – 1	~	~														
	PH101	Physics -1			~	V			V						1			
	CS101	IT Essentials		V				1										
Level 1	CS202	Logic Design – 1														V		~
eve	HUM101	Human Rights	~	✓	~	V												
7	ETS101	Professional Ethics	~	1	1	1												
	MT111	Mathematics –				~	~	-		1								~
	CS112	Computer Language-1					1	~	/									
	CS113	Data Structure		/	~		/	-	1									
	CS114	Operations Research			~						1							
	IT301	Introduction to Web technologies			1	~			V									~
	ENG112	English-2	1		-													
10"	MT201	Mathematics – 3	~	~	~	~												
Level 2	CS205	Computer Architecture and Organization				✓		8	×		~			✓		✓		
	MT301	Statistics & Probabilities-1	V	/														





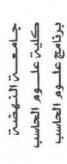
						1319888					ــوم				The same of the sa	No. of Concession, Name of Street, or other Designation, Name of Street, Name		
Level	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d1 0	d1 1	d1 2	d1 3	d1 4	d1 5	d
	CS203	Analysis & Design of Algorithms		✓	1											√		
	CS215	Operating System – 1	~	√	1													
	CS214	Computer Peripherals			~					1								
	MT311	Statistics & Probabilities-2		V				✓							✓			,
	CS212	Logic Design –	~		-5	2"	~	✓										
	MT211	Mathematics – 4							14									,
	CS308	Graph Theory in computer science		✓			×.	V										
	CS312	Computer Language-2					√	√	V									
	CS216	File Organization							8		V						✓	
	ENG113	English-3	V															
	CS302	Assembly Language	~			✓			1	V								
	CS404	Image Processing		9.40					✓ .									,
	CS305	Computer Networks -1		4												✓		
	IT403	Multimedia	73.53		V											~		
Level 3	CS304	Software Engineering – 1							\								~	
	CS313	Computer Networks -2										+			1	✓		
	CS310	Logic Programming	~	~														
	HUM205	Scientific & Technical Report writing	~	V.	1	1												
	ST205	Statistical Methods							V		✓							
	C303	Communication		√				/										





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Level	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d1 0	d1 1	d1 2	d1 3	d1 4	d1 5	d1 6
		system										U	-		-	-	3	U
	IT308	Problem Solving Techniques		V								1						
	CS309	Advanced Computer Organization			~								✓					
	IS303	Database Systems							~								~	
	CS401	ES Development	~	√														
	CS402	Operating System – 2	~	1	~	/	1											
	CS405	Project	~	V	~	✓	~	~	V	V	V	V	~	V	V	/	V	V
	CS411	Object Oriented Programming			1		~						V		\	~		
	CS314	Software Engineering – 2						√		✓			√		1	1		
	D409	Decision and game theory	~		/								1					V
4	CS407	Computer Arabization	~	√				✓				√						
Level 4	CS412	Knowledge Base Systems	~	✓	~	\												
	CS413	Neural Networks						✓			1					1		
	IT401	Computer Animation	V	✓					1									V
	IT403	Multimedia			1											~		
	IT404	Computer Graphics - 1				~												
	IT411	Pattern Recognition	~	√														
	IT412	Artificial Intelligence	~	V			*	4										
	IT314	Computer Organization				\					~			~		V		





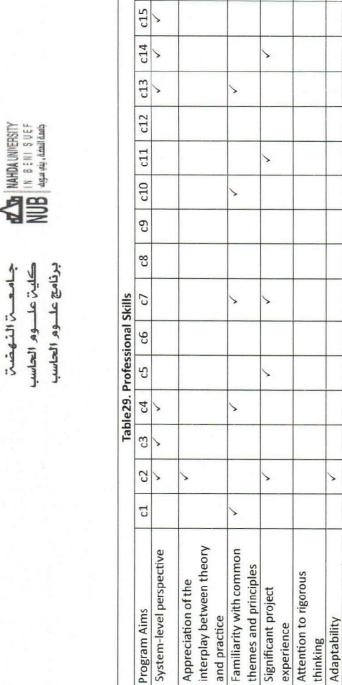


Program Matrix VII (Aims - ILOs)

				_	able2	7. Kn	owle	dge al	nd Ur	derst	anding	Table 27. Knowledge and Understanding Skills									
Program Aims	Aims	a1	a2	a3	a4	a5	a6	a7 a	a8 a	a9 a1	a10 a	a11 a	a12 a	a13	a14	a15	a16	a17	a18	a19	a20
-:	System-level perspective	>			>	>						>				>		>			
=	Appreciation of the interplay between theory						>	-	>								>	>			
	and practice																				
ij	Familiarity with common	>	>	>	>		>	>												>	
	themes and principles																				1
.∨	Significant project					>			>		>						>				
	experience																				G.
>	Attention to rigorous		>	4			>						>	60.					>		
	thinking												-								
-	Adaptability									>					>						>
						Ta	ble28	3. Inte	llectu	Fable 28. Intellectual Skills	IIs										al la
Program Aims	Aims		b1		b2 b3	3 b4	- b5	99	b7	98 P8	6q	b10	b11	. b12	_	b13 b	b14 k	b15 1	b16	b17	b18
.⊪	System-level perspective		>	>			>			>	>										>
VIII.	Appreciation of the interplay	ay			-	-					>		-	-	-	-			>		
	between theory and practice	ce																			
X.	Familiarity with common themes	neme	S		>	>		>		>		>	>				>			>	
	and principles																		-		
×.	Significant project experience	ce		>		-			>					>							
XI.	Attention to rigorous thinking	ng		>	>	>	>		>					>	>	>			>		
XII.	Adaptability			>				>				>									



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			Tab	le30.	Table 30. General and Transferable Skills	al and	Transfe	erable	Skills								
Program Aims	Aims	d1	d2	d3	d4	d5	9p	d7	gp	6p	d10	d10 d11	d12	d13	d14	d15	d16
<u>-</u> :	System-level perspective	>	>			>			>	>			>	>			
=	Appreciation of the interplay between theory and practice			>		>				>							>
<u>:</u>	Familiarity with common themes and principles							>									
١٧.	Significant project experience						>							>		>	>
>	Attention to rigorous thinking											>			>		
N.	Adaptability				>				>	>			>				





Table31. Mapping between Learning Methods and ILO's

	1- TEACHING AND LEAD			ing and		ing M	ethods	
nten	ded Learning Outcomes (ILO's) of the Program	Lecture	Tutorials	Practical exercises	Workshop	Projects	Case	Data
	a.1) Recognize the essential mathematics relevant to computer science.	1	1					
	a.2) Explain code written in high-level programming languages	V	✓	V		√		
	a.3) Demonstrate basic knowledge and understanding of a core of mathematical analysis.	✓	V		✓			
	 a.4) Demonstrate basic knowledge and understanding of a core of statistics. 	✓	V					
	 a.5) Interpret and analyze data qualitatively and/or quantitatively. 		✓				✓	
	a.6) Describe the principles and techniques of a number of application areas informed by the research directions of computer science.	✓			✓		~	✓
	a.7) Show a critical understanding of the principles of artificial intelligence, image, and pattern recognition.	/	1	✓		✓		✓
nding	a.8) Define the fundamental topics in computer systems, including hardware architectures and operating systems.	✓	1	✓	1		✓	
ndersta	a.9) Define the fundamental topics in computer science, including software architectures, software engineering principles and methodologies, and software tools.	V	1	1	1			✓
Knowledge and Understanding	a.10) Define advanced topics to provide a deeper understanding of some aspects of the hardware systems design, operating systems, computer security and compiler theory	✓	~	1	1	√	~	✓
wiedg	a.11) Discuss advanced topics to provide a deeper understanding of some aspects of object-oriented analysis and design, and software engineering.	✓ ,	~			✓		√
Kno	a.12) Identify advanced topics to provide a deeper understanding of some aspects of the artificial intelligence, image processing, and computer graphics and animation.	√	~	V		✓		√
	a.13) Express strong knowledge of fundamentals of programming and the construction of computer-based systems	Ź	1	1		~		
	a.14) Outline strong knowledge of fundamentals of data structures and algorithms	✓	~	1	✓		✓	
	a.15) Show a critical understanding of the broad context within computing including issues such as quality, reliability, enterprise, employment law and accounting	√			1		~	
	a.16) Provide a deeper understanding of legal, professional and moral aspects of the exploitation of computing	V			✓			
	a.17) Recognize the knowledge of the tools, practices	1	/	/		/	/	





			سب	وم الحا	عد هدا	برا		
	and methodologies used in the specification, design, implementation and critical evaluation of computer software systems							
	a.18) Define and assess criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.	✓			✓			~
	a.19) Define of the current and underlying technologies that support computer processing and inter-computer communication	✓	~	✓	✓			
	a.20) Define the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	√	✓	√		✓		~
			Teachir	ng and l	Learni	ng Met	hods	
Intend	ded Learning Outcomes (ILO's) of the Program	Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data
	b.1) Formulate traditional and nontraditional problems, set goals towards solving them, and observe results.		1					
	b.2) Compare between (algorithms, methods, techniquesetc).		V .					
	b.3) Classify (data, results, methods, techniques, algorithms. etc.).		V					
	b.4) Identify attributes, components, relationships, patterns, main ideas, and errors.		~					
	b.5) Conclude the result of the proposed solutions.		1	/				
	b.6) Restrict solution methodologies upon their results.		V	✓				
	b.7) Compose criteria, and verify solutions.					V		
	b.8) Identify a range of solutions and critically evaluate and justify proposed design solutions		1					
S	b.9) Solve computer science problems with pressing, commercial or industrial constraints.		✓ ·					
Intellectual Skills	b.10) Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.		✓	1	✓		✓	~
ectus	b.11) Formulate and model computer systems at different and appropriate levels of abstraction.		V	V				
ntell	b.12) Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).		~	✓		✓		
	b.13) Analyzes and evaluate a range of options in producing a solution to an identified problem.		√					
	b.14) Analyze problem from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).		1					
	b.15) Outline the concepts, principles, theories and practices underpinning computing as an academic discipline.		✓	✓				





					-	٠.		
	b.16) Develop and assess criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof		~				~	
	b.17) Create ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.		~		2		✓	√
	b.18) Evaluate the results of tests to investigate the functionality of computer systems		~	/				
		Teach	ning and	Learn	ing M	ethods		
Intended program	Learning Outcomes (ILO's) of the	Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data
	c.1) Use appropriate programming languages and design methodologies.		✓	/		✓		
44.3	c.2) Use appropriate web-based systems, tools and design methodologies.		~	✓		✓		
	c.3) Use appropriate database systems.		V	V		✓		
	c.4) Perform independent information acquisition and management, using the scientific literature and Web sources.	~					~	~
	c.5) Specify, design, and implement computer-based systems.	1	~	✓		V		
	c.6) Evaluate systems in terms of general quality attributes and possible tradeoffs	1	~		✓			1
nal Skills	kinds, including text, images, sound, and video		· ·	V	✓			✓
Profession	c.8) Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems	-	1	✓	✓			~
ď	involved in the operation of computing equipment within a given context.	✓	18		✓			~
	c.10) Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.		~	√		1	✓	
	c.11) Make effective use of general computing facilities, plan and manage a project to complete within budget and schedule.		~		✓			✓
	c.12) Appreciate and manage the need for continuing professional development in recognition of the need for lifelong learning.	√			✓			✓





	c.13) Address and apply professional, moral and ethical							
	issues within the discipline.	~			✓			
	c.14) Operate computing equipment efficiently, considering its logical and physical properties.		~	✓		1		
	c.15) Use investigative skills to research new and novel aspects of their work	✓			✓			~
	c.16) Apply tools and techniques for the design and development of applications		~	✓		/		~
			Teach	ing and	Leari	ning Mo	ethods	
Inten	ded Learning Outcomes (ILO's) of the program	Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data
	d.1) Communicate effectively by oral, written and visual means.				1	~	~	
	d.2) Work effectively as an individual and as a member of a team.				✓	1	√	
	d.3) Collaborate effectively within multidisciplinary team.		1	√				
	d.4) Work in stressful environment and within constraints.				√		V	1
	d.5) Prepare and present seminars to a professional standard.		~	✓				
General Skills	d.6) Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy.		~		✓		✓	
S	d.7) Demonstrate efficient IT capabilities.		V		✓	/	/	
<u>-2</u>	d.8) Lead and motivate individuals.		1			/	1	
e	d.9) Manage tasks and resources.		1		✓	/		/
Ger	d.10) Search for information and adopt life-long self-learning.		1				1	~
	d.11) Acquire entrepreneurial skills.						/	/
	d.12) Manage one's own learning and development.		· /			V	V	/
	d.13) Prepare their work in the form of reports.		1				✓	V
	d.14) Communicate effectively with team members, managers and costumers.	-	1	-		1		
	d.15) Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.		7		1			
	d.16) Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material.		~				V	~



Table32. Mapping between Assessment Methods and ILO's

			Assessi	ment m	ethods	
nten	ded Learning Outcomes (ILO's) of the program	Final	Midterm Exam	Practical Exam	Class	Oral
	a.1) Recognize the essential mathematics relevant to computer science.	~	✓			
	a.2) Explain code written in high-level programming languages	✓	✓	✓	/	
	a.3) Demonstrate basic knowledge and understanding of a core of mathematical analysis.	✓	✓		✓	
	a.4) Demonstrate basic knowledge and understanding of a core of statistics.	✓	✓		✓	
	a.5) Interpret and analyze data qualitatively and/or quantitatively.	✓	✓		✓	
ing	a.6) Describe the principles and techniques of a number of application areas informed by the research directions of computer science.	✓	✓			
and	a.7) Show a critical understanding of the principles of artificial intelligence, image, and pattern recognition.	1	~	~	1	
ndersi	a.8) Define the fundamental topics in computer systems, including hardware architectures and operating systems.	1	✓		~	
e and U	a.9) Define the fundamental topics in computer science, including software architectures, software engineering principles and methodologies, and software tools.		· ✓	1	✓	
Knowledge and Understanding	a.10) Define advanced topics to provide a deeper understanding of some aspects of the hardware systems design, operating systems, computer security and compiler theory	√	~ ✓	~	~	
3	a.11) Discuss advanced topics to provide a deeper understanding of some aspects of object-oriented analysis and design, and software engineering.	~	~		~	
	a.12) Identify advanced topics to provide a deeper understanding of some aspects of the artificial intelligence, image processing, and computer graphics and animation.	~	✓	V	~	
	a.13) Express strong knowledge of fundamentals of programming and the construction of computer-based systems	√	✓	✓	~	
	a.14) Outline strong knowledge of fundamentals of data structures and algorithms.	✓	~	✓	/	
	a.15) Show a critical understanding of the broad	V	/		/	





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	context within computing including issues such as quality, reliability, enterprise, employment law and accounting					
	a.16) Provide a deeper understanding of legal, professional and moral aspects of the exploitation of computing	V	1	,		
	a.17) Recognize the knowledge of the tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems	✓	V	✓	~	
	a.18) Define and assess criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.	✓	✓			
	a.19) Define of the current and underlying technologies that support computer processing and inter-computer communication	1	~		1	
	a.20) Define the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	✓	✓		V	
			Assessi	ment m	ethods	
Inter	nded Learning Outcomes (ILO's) of the program	Final	Midterm Exam	Practical Exam	Class	Oral Exam
	b.1) Formulate traditional and nontraditional problems, set goals towards solving them, and observe results.	✓	~		V	
	b.2) Compare between (algorithms, methods,					
	techniquesetc).	✓	V		✓	
		✓ ✓	✓ ✓		✓ ✓	
	techniquesetc). b.3) Classify (data, results, methods, techniques,					
2	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions.	✓ ✓	✓ ✓	✓	✓ ✓	
SIII	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions. b.6) Restrict solution methodologies upon their results.	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓ ✓ ✓	
al Skills	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions. b.6) Restrict solution methodologies upon their results. b.7) Compose criteria, and verify solutions. b.8) Identify a range of solutions and critically evaluate	✓ ✓	✓ ✓		✓ ✓	
	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions. b.6) Restrict solution methodologies upon their results. b.7) Compose criteria, and verify solutions.	\[\lambda \] \[\lambda \] \[\lambda \] \[\lambda \]	\(\)		\[\lambda \] \[\lambda \]	
	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions. b.6) Restrict solution methodologies upon their results. b.7) Compose criteria, and verify solutions. b.8) Identify a range of solutions and critically evaluate and justify proposed design solutions b.9) Solve computer science problems with pressing,	\(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\square \) \(\s	\(\frac{1}{\sqrt{1}} \)			
	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions. b.6) Restrict solution methodologies upon their results. b.7) Compose criteria, and verify solutions. b.8) Identify a range of solutions and critically evaluate and justify proposed design solutions b.9) Solve computer science problems with pressing, commercial or industrial constraints. b.10) Generate an innovative design to solve a problem containing a range of commercial and	\(\)	\(\frac{1}{2} \)	✓		✓
Intellectual Skills	techniquesetc). b.3) Classify (data, results, methods, techniques, algorithms. etc.). b.4) Identify attributes, components, relationships, patterns, main ideas, and errors. b.5) Conclude the result of the proposed solutions. b.6) Restrict solution methodologies upon their results. b.7) Compose criteria, and verify solutions. b.8) Identify a range of solutions and critically evaluate and justify proposed design solutions b.9) Solve computer science problems with pressing, commercial or industrial constraints. b.10) Generate an innovative design to solve a problem containing a range of commercial and industrial constraints. b.11) Formulate and model computer systems at	\(\)	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	✓ ·	\(\sqrt{ \sq}\q \sqrt{ \q \sqrt{ \sq\sq \sq\sq \sqrt{ \sqrt{ \sqrt{ \qq} \squit{ \sqrt{ \sqrt{ \sq}} \squit{ \squit{ \squit}	





			*			
	b.14) Analyze problem from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).	~	✓		✓	
	b.15) Outline the concepts, principles, theories and practices underpinning computing as an academic discipline.	~	~	~	~	
	b.16) Develop and assess criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof	~	~		~	
	b.17) Create ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.				√	1
	b.18) Evaluate the results of tests to investigate the functionality of computer systems			√	√	
			Assess	ment m	ethods	
Intend	led Learning Outcomes (ILO's) of the Program	Final	Midterm	Practical Exam	Class	Oral
	c.1) Use appropriate programming languages and design methodologies.	✓	✓	✓	√	
	c.2) Use appropriate web-based systems, tools and design methodologies.	✓	√	√	√	
	c.3) Use appropriate database systems.	V	V	✓	✓	
	c.4) Perform independent information acquisition and management, using the scientific literature and Web sources.			√	V	
	c.5) Specify, design, and implement computer-based systems.	✓	~	✓	√	
	c.6) Evaluate systems in terms of general quality attributes and possible tradeoffs	✓	✓		✓	
-	c.7) Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video	~	1	1	✓	
	c.8) Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems	~	~	~	1	
	c.9) Identify any risks or safety aspects that may be involved in the operation of computing equipment within a given context.	1	~		1	
	c.10) Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.	✓	✓	✓	✓	
	c.11) Make effective use of general computing					





				-		
	c.12) Appreciate and manage the need for continuing professional development in recognition of the need for lifelong learning.		✓			
	c.13) Address and apply professional, moral and ethical issues within the discipline.		✓			√
	c.14) Operate computing equipment efficiently, considering its logical and physical properties.		✓	V	✓	1
	c.15) Use investigative skills to research new and novel aspects of their work		V		V	
	c.16) Apply tools and techniques for the design and development of applications		√	✓	/	
			Assessi	ment m	ethods	
Inten	ded Learning Outcomes (ILO's) of the Program	Final	Midterm Exam	Practical Exam	Class Work	Oral Exam
	d.1) Communicate effectively by oral, written and visual means.	✓	~	✓	1	~
	d.2) Work effectively as an individual and as a member of a team.			√	1	
	d.3) Collaborate effectively within multidisciplinary team.			~	/	
	d.4) Work in stressful environment and within constraints.			✓	1	
	d.5) Prepare and present seminars to a professional standard.			✓	✓	
General Skills	d.6) Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy.			~	✓	
	d.7) Demonstrate efficient IT capabilities.			✓	✓	
rra	d.8) Lead and motivate individuals.			✓	✓	
Suc	d.9) Manage tasks and resources.	V	~	V	V	
Š	d.10) Search for information and adopt life-long self-learning.			~	V	V
	d.11) Acquire entrepreneurial skills.			1	V	
	d.12) Manage one's own learning and development.			✓	√	
	d.13) Prepare their work in the form of reports.			✓	√	
	d.14) Communicate effectively with team members, managers and costumers.			✓	✓	
	d.15) Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.	√	✓	V	√	1
	d.16) Develop a range of fundamental research skills,		1			

	Name	Signature
Program Specification committee	Dr. Abdelmoaty Mahmoud Dr. Abdelaziz Mohamed Dr. Saeed Khodary Hamouda Dr. Amr A. Hassanain Dr.Ayman Mohamed.	Junei.
Program Coordinator	Dr. Abdelaziz Mohamed	
Approved by the Dean	Prof.Dr. Mohamed Ali saleh	Mohand Sele







جامعة النهضة كلية علوم الحاسب

Program Specification

A-	Basic	Inioi	ma	ttioi	1		
		AND DESCRIPTION OF THE PARTY OF	500	S (75)			

1-	Program Title:	Bachelor	Degree in	Computer so	cience		
2-	Program Type:	Single		Double		Multiple	
3-	Department offe	ring the p	rograms:	Computer s	cience		

4- Last date of program specification approval: 1/3/2021

B- Professional Information:

The mission of the Computer Science Department is to provide students with an understanding of computer science concepts, processes, and tools and to equip students with the analytical, design, and communication skills necessary to build computing systems. The applied nature of computer science necessitates involving students in software development projects, research projects, and/or internships as part of their learning experience. Undergraduate and graduate students are presented opportunities to investigate in depth those areas of computer science that correspond to faculty research, creative projects and interests, and are provided an understanding of the open questions in those areas.

The department provides courses to other undergraduate programs to meet their computing needs, and offers courses and programs in which knowledge and training in computing enhances and complements other majors.

Computer Science is a technology-oriented discipline whose fundamental principles combine theory, abstraction and design. A solid foundation in the fundamental principles is critical to continued learning and adaptation to the technological changes which occur so rapidly in this discipline. The department prepares its graduates for professional employment and graduate education by emphasizing these principles and their application to solution of specific problems, while also addressing the ethical and social issues associated with computing.

Program Aims: By the end of this program the student must be able to:

 Provide a course of the highest academic quality in Computer Science in a challenging and supportive learning environment that attracts the very best students from the NUB and elsewhere.





- Provide a current, comprehensive and client-centered environment for the teaching and learning of computer science and related professional values to enable the students to apply these foundations to the development of algorithmic design and problem-solving skills.
- 3. Provide the students with the means necessary to acquire practical and analytical skills for employment within a technical environment
- 4. Provide a computer literacy course which will give all students the basic knowledge of computers, their components, applications and related social issues, as well as hands-on experience with current software applications.
- 5. Prepare students for professional careers or advanced studies in computer science.
- 6. Promote the discovery, dissemination and application of knowledge involving computing.
- 7. Support the community by offering service courses that meet the retraining needs of computer professionals in the area of computer science
- 8. Layout the foundation for continuing education and growth in the field of computing.
- 9. Bring students to positions on graduation where they can choose confidently from a wide range of careers, both within the Information Technology sector and outside it.
- 10- Develop transferable skills relating to problem solving and spoken and written communication.

1- Attributes of the Graduates:

By the end of this program the student must be able to:

- Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and software based systems.
- 2. Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design, implementation, evaluation and evolution of computer-based systems.
- 3. Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data.
- Demonstrate the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic approaches.
- Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique.
- 6. Understand and apply a wide range of principles and tools of natural language processing and data mining.
- 7. Have a solid understanding of the used concepts in computer science to be able to pursue further learning, whether as graduate students or on their own.
- 8. Demonstrate an understanding of algorithms and data structures, computer organization and architecture, programming language concepts, compilers, networks, artificial intelligence, graphics, human computer interfaces, and databases, and identify and define the computing requirements for its solution.





9. Design, implement, and evaluate a computer-based systems, process, component or program.

10. Use knowledge and understanding in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoff involved in design choices.

2- Intended Learning Outcomes (ILOs)

2.1 Knowledge and Understanding

The Computer Science graduate should be able to:

- Acquire the essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.
- 2. Illustrate the modeling and design of computer-based systems bearing in mind the trade-offs.
- 3. Familiarize with tools, practices & methodologies used in the specification, design, implementation and evaluation of computer software systems.
- 4. Acquire the criteria and specifications appropriate to specific problems, and plan strategies for their solution.
- 5. Demonstrate the extent to which a computer-based system meets the criteria defined for its current use and future development.
- Explain the current and underlying technologies that support computer processing and inter-computer communication.
- Explain the principals of generating tests which investigate the functionality
 of computer programs and computer systems and evaluating their results.
- 8. Demonstrate the management and economics principles relevant to computing and information disciplines.
- Explain the professional, moral and ethical issues involved in the exploitation
 of computer technology and be guided by the appropriate professional, ethical
 and legal practices relevant to the computing and information industry.
- 10. Demonstrate the current developments in computing and information research.
- Recognize the requirements, practical constraints and computer-based systems
 - 12. Understand the essential mathematics relevant to computer science.
 - 13. Use high-level programming languages.
 - 14. Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.
 - 15. Interpret and analyzing data qualitatively and/or quantitatively.
 - 16. Know and understand the principles and techniques of a number of application areas informed by the research directions of the subject, such as artificial intelligence, natural language processing, data mining, databases and computer graphics.
- 17. Show a critical understanding of the principles of artificial intelligence, image, and pattern recognition.





- 18. Understand the fundamental topics in Computer Science, including hardware and software architectures, software engineering principles and methodologies, operating systems, compilers, parallel and distributed computing, systems and software tools.
- 19. Select advanced topics to provide a deeper understanding of some aspects of the subject, such as hardware systems design, object-oriented analysis and design, and artificial intelligence, and parallel and concurrent computing.

2.2 Intellectual Skills

The Computer Science graduate should be able to:

- 1. Analyze computing problems and provide solutions related to the design and construction of computing systems.
- 2. Identify the concepts, principles, theories and practices behind computing and information as an academic discipline.
- 3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.
- 4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.
- 5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.
- Discuss the results of tests to investigate the functionality of computer systems.
- 7. Make judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact
- 8. Analyze the professional, legal, moral and ethical issues relevant to the computing industry.
- 9. Analyze research papers in a range of knowledge areas
- 10. Distinguish between traditional and nontraditional problems, set goals towards solving them, and observe results.
- 11. Compare between algorithms, methods, techniques...etc.
- 12. Classify data, results, methods, techniques, algorithms.. etc.
- 13. Identify attributes, components, relationships, patterns, main ideas, and errors.
- 14. Summarize the proposed solutions and their results.
- 15. Restrict solution methodologies upon their results.
- 16. Establish criteria, and verify solutions.
- 17. Identify a range of solutions and critically evaluate and justify proposed design solutions.
- 18. Solve computer science problems with pressing commercial or industrial constraints.
- 19. Apply innovative design methods to solve problems containing commercial and industrial constraints.

2.3 Professional and Practical Skills

The Computer Science graduate should be able to:





- 1. Operate computing equipment, recognizing its logical and physical properties, capabilities and limitations.
- Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems.
- 3. Deploy the equipment and tools used for the construction, maintenance and documentation of computer applications.
- 4. Apply computing information retrieval skills in computing community environment and industry.
- 5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material
- Assess the implications, risks or safety aspects involved in the operation of computing equipment within a specific context.
- 7. Handle a mass of diverse data, assess risk and draw conclusions.
- 8. Use appropriate programming languages, web-based systems and tools, design methodologies, and knowledge and database systems.
- 9. Communicate effectively by oral, written and visual means.
- Perform independent information acquisition and management, using the scientific literature and Web sources.
- 11. Prepare and present seminars to a professional standard.
- 12. Perform independent information acquisition and management, using the scientific literature and Web sources.
- 13. Prepare technical reports, and dissertations to a professional standards.
- 14. Design computer-based systems.
- 15. Implement computer-based systems.
- 16. Maintain computer-based systems.
- 17. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
- 18. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.
- Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems.
- Identify risks and safety aspects that may be involved in the operation of computing equipment within a given context.
- 21. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.

2.4. Transferable skills

Graduates of the Computer Science programs should be able to:

- 1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.
- 2. Demonstrate the skills in group working, team management, time management and organizational skills.
- 3. Show the use of information-retrieval.





- 4. Use an appropriate mix of tools and aids in preparing and presenting reports for a range of audiences, including management, technical, users, industry or the academic community.
- 5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.
- Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.
- 7. Show the use of general computing facilities.
- 8. Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.

3- Academic Standards

-National Academic Reference Standards (NARS)

4- The Benchmarks

-National Academic Reference Standards (NARS)

5- The structure and contents of the program:

- 5.1. Program duration: 8 semesters
- 5.2. Program structure:

- Credit hours:	Required 146	Lectures 100	Practical 46
- Credit hours of bas	sic computer sciences courses:	No. 72	% 49.3
- Credit hours of sup	porting general sciences courses:	No. 15	% 10.3
- Credit hours of soc	ial/humanities sciences courses:	No. 14	% 9.5
- Credit hours of spe	cialized courses:	No. 45	% 30.8

- Program levels (in credit hours system): 4 levels





- 5.3. Program levels (in credit hours system):
 - Level 1(Freshman): passed less than 36 Credit hours
 - Level 2 (Sophomore): Required to pass 36 Credit hours and less than 72 Credit hours
 - Level 3 (Junior): Required to pass 72 Credit hours and less than 108 Credit hours
 - Level 4(Senior): Required to pass 108 Credit hours and less than 144 Credit hours

6- Program Courses:

a. Faculty Requirements

6.1. Level: Freshman

Semester: Fall

ASSESSMENT OF THE PARTY OF THE				o o intester i i un		
Code	Course Title	Credit	weekly hours			
		hours	Lectures	Practical		
ENG111	English-1	1	1	-		
REM101	Scientific Thinking	2	2	-		
MGT101	Principles of general management	3	2	2		
MT101	Mathematics – 1	3	2	2		
PH101	Physics -1	3	2	2		
CS101	IT Essentials	3	2	2		
CS202	Logic Design – 1	3	2	2		
Total		18				

Level: Freshman Semester: Spring

Code	Course Title	Credit	weekly hours	
		hours	Lectures	Practical
ENG111	English-1	0	1	-
HUM101	Human Rights	2	2	_
ETS101	Professional Ethics	1	1	_
MT111	Mathematics – 2	3	2	2
CS112	Computer Language-1	3	2	2
CS113	Data Structure	3	2	2
CS114	Operations Research	3	2	2
IT301	Introduction to Web technologies	3	2	2
otal		18		





Level: Sophomore

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Code	Course Title	Credit	weekly hours		
		hours	Lectures	Practical	
ENG112	English-2	1	1	-	
MT201	Mathematics – 3	3	2	2	
CS205	Computer Architecture and Organization	3	2	2	
MT301	Statistics & Probabilities-1	3	2	2	
CS203	Analysis & Design of Algorithms	3	2	2	
CS215	Operating System – 1	3	2	2	
CS214	Computer Peripherals	2	1	2	
otal		18			

Level: Senior

Semester: Fall

Code	Course Title	Credit	weekly hours		
0000		hours	Lectures	Practical	
CS401	ES Development	3	2	2	
CS402	Operating System – 2	3	2	2	
-	Selected topic	3	2	2	
-	Selected topic	3	2	2	
	Selected topic	3	2	2	
CS405	Project	3	2	2	
otal		18			





Level: Sophomore

Semester: Spring

Code	Course Title	Credit	weekly hours		
	Course True	hours	Lectures	Practical	
ENG112	English-2	0	1	-	
MT311	Statistics & Probabilities-2	3	2	2	
CS212	Logic Design – 2	3	2	2	
MT211	Mathematics – 4	3	2	2	
CS308	Graph Theory in computer science	3	2	2	
CS312	Computer Language-2	3	2	2	
CS216	File Organization	3	2	2	
Total		18			

Level: Junior

Semester: Fall

		Semester, run				
Code	Course Title	Credit	weekly hours			
Code	Course Title	hours	Lectures	Practical		
ENG113	English-3	2	1	2		
CS302	Assembly Language	3	2	2		
CS404	Image Processing	3	2	2		
CS305	Computer Networks -1	3	2	2		
	Selected topic	4	3	2		
	Selected topic	3	2	2		
Total		18				

Level: Junior

Semester: Spring

		Semester, Spring					
Code	Course Title	Credit	weekly hours				
	Course Title	hours Lectures 0	Lectures	Practica			
ENG113	English-3	0	1	2			
IT403	Multimedia	3 2		2			
CS304	Software Engineering – 1	3	2	2			
CS313	Computer Networks -2	3	2	2			
CS310	Logic Programming	3	2	2			
-	Selected topic	3	2	2			
•	Selected topic	3	2	2			
Total		18					





Level: Senior

Semester: Spring

Code	Course Title	Credit	weekly	ly hours	
		Credit Week	Practical		
CS411	Object Oriented Programming	3	2	2	
CS314	Software Engineering – 2	3	2	2	
-	Selected topic	3	2	2	
(-)	Selected topic	3	2	2	
/-	Selected topic	3	2	2	
CS405	Project	3	2	2	
otal		18			

المقررات الاختيارية -b

Code	Course Title	Units	weekly hours		
		Units	weekly Lectures 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Practica	
CS309	Advanced Computer Organization	3	2	2	
CS407	Computer Arabization	3	2	2	
CS412	Knowledge Base Systems	3	2	2	
CS413	Neural Networks	3	2	2	
IS303	Database Systems	3	2	2	

c- University electives

Code	Course Title	Units	weekly hours		
	Course Title	Ollits	Lectures	Practical	
ENG111	English-1	1	1	-	
ENG112	English-2	1	1		
ENG113	English-3	2	1	2	
ENG103	English	3	3		
HUM101	Human Rights	2	3	-	
REM101	Scientific Thinking	2	2		
ETS101	Professional Ethics	1	1	-	
MGT101	Principles of general management	3	3		

7- Program admission Requirements for: (Regulations- Courses -)

- أصل شهادة الثانوية العامة أو ما يعادلها
 دخول امتحان تحديد مستوى اللغة الانجليزية
 اجتياز الكشف الطبى





$\ensuremath{\mathsf{8-}}$ Methods of the assessment of the learning target output :

No.	Method	Learning target output
1	Quizzes	a 1,3,4,5,7, c 3,10,d 5
2	Assignment	a 1,3,4,5,7,8,b 1,2,3,4, c 5,12, d 1,6,8,2
3	Practical exam	a 2, b 1,5,6,7,8,9,10,c 1.6,7,9,d 4,6,7
4	Oral Exam	a 6, b1,5, c 2,4,10, d 1,2,3
5	Written Exams (mid-term & final)	a 1,2,3,4,7 ,b 1,2,b3 ,c9 ,c12, d5

9- Methods of the program evaluation:

No.	Evaluator	Method	Sample	
1	Students of final level	Questioner, student	Percentage of each	
2 Graduates		Evaluating statistics provided by G communication center		
3	Business owners	questioner	Reachable owners	
4	External Evaluator	Evaluate Program, facilities, exams,	Percentage of each grade	
5	Other methods	Annual accepted student	6	





10- Curriculum Structure and Contents

a. Program duration

8 main semesters, equivalent to 4 years (program can be competed in 7 main semesters)

b. Program structure

1. No. of total credit hours = 144 credit hours detailed as follows:

	Sem-1	Sem-2	Sem-3	Sem-4	Sem-5	Sem-6	Sem-7	Sem-8
Total	18	18	18	18	18	18	18	18
Compulsory	18	18	18	18	11	12	9	0
Elective	-	-	-	_	7	6	9	9

	Sem-1	Sem-2	Sem-3	Sem-4	Sem-5	Sem-6	Sem-7	Sem-8
University	6	3	1	0	2	0	0	0
Faculty Compulsory	12	15	17	18	-	-	-	-
Computer Science Compulsory	-	-	-	-	9	12	6	6
Computer Science Elective	1=	-	-		7	6	9	9
Grad Project	11000	-	-	_	-	_	3	3

Program Coordinator: Dr. Abdel Aziz Mohamed Abdel Aziz

Signature:

Date: