



**Higher Technological Institute (HTI)**

**Department of Computer Sciences  
Undergraduate Program Specification**

**Bachelor of Science in  
Computer Sciences  
Program Specification**

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## 1. GENERAL

### 1.1 Basic Information

Award	Program Title	Duration	Mode of study
B.Sc.	Computer Science	4 years	Day Mode

<b>Department</b>	Computer Science
<b>Department Coordinator</b>	Computer Science Dr\ Rania Ragab Hussien
<b>Assistant Coordinator</b>	Dr\ Dina Awny
<b>External Evaluator(s)</b>	<b>Dr. Mohamed Galal Al Din Aissa</b>
<b>Awarding Institution</b>	Higher Technological Institute
<b>Academic Standards</b>	The program applies National Academic Reference Standards (NARS), October 2010
<b>Program Commencement</b>	October, 2022
<b>Date of Program Specification Approval</b>	October 2022

### 1.2 Department Members

<b>Professor</b>	<b>1</b>	<b>Appendix (1)</b>
<b>Associate Professor</b>	-	
<b>Teacher</b>	<b>15</b>	
<b>Teacher Assistant</b>	<b>5</b>	
<b>Instructor</b>	<b>14</b>	

### 1.3 Program External Reviewing

Program reviewing was achieved by:

- 1- Internal reviewing from Institute QAC (appendix 2)
- 2- External Reviewers CV assigned by Institute QAC (appendix 3)
- 3- External Reviewer(s) reports (appendix 4)
- 4- Faculty response to Internal/External reviewing reports (appendix 5)

## 2. PROFESSIONAL INFORMATION

### 2.1 Program Mission

The Department of Computer Science seeks to provide excellent educational programs in the field of computer science and information technology, which is concerned with responding to the scientific and technical changes witnessed by the world on the one hand and responding to the requirements of the local community in this field on the other hand. Distinctive performance contributes to the transfer of technology to society and keep pace with the requirements of sustainable development.

### 2.2 Program Objectives

Computer Science program is designed to provide the student with the foundations of the discipline as well as the opportunity for specialization.

#### **Program aims to:**

- Maintaining excellence in educational experience.
- Strengthening the competitiveness of graduates.
- Supporting continuous development through national partnerships.
- Enhancing the department's role and impact on the local and regional community.
- Improving the performance of faculty members.
- Producing innovative scientific research at the local and regional level.

#### **After successfully completing Computer Science program, graduate should be:**

#### **Generally, in the computing and Information should be able to:**

1. Apply the fundamental theories and principles of computing and information applications.
2. Integrate and evaluate computing tools and facilities.
3. Apply knowledge of mathematics and science.
4. Design a computing system, component, and process to meet the required needs within realistic constraints.
5. Exploit the techniques, skills, and up-to-date computing tools necessary for computing and information practice.
6. Display professional responsibilities and ethical, societal, and cultural concerns.
7. Use, compare and evaluate a range of formal and informal techniques, theories, and methods to develop computing and information applications.
8. Consider and deal with the individual, social, environmental, organizational, and economic implications of the application of computing and information.
9. Carry out a work plan with minimal supervision.
10. Communicate effectively.
11. Hold knowledge and skills required by the computing and information industry.
12. Engage in self and life-long learning and research in computing and information.
13. Fulfill requirements of potential employers.

**And specially, in the computer science program should be able to:**

1. 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.
4. Demonstrate the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic approaches.
5. 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 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.

## 2.3 Intended Learning Outcomes (ILOs) of the Program

### 2.3.1 Knowledge & understanding:

<b><u>By the end of the program, students should acquire the knowledge and understand of:</u></b>	
<b>A1.</b>	Essential facts, concepts, principles, and theories relating to computing and information and computer applications as appropriate to the program of study.
<b>A2.</b>	Modeling and design of computer-based systems bearing in mind the trade-offs.
<b>A3.</b>	Tools, practices, and methodologies used in the specification, design, implementation and evaluation of computer software systems.
<b>A4.</b>	Criteria and specifications appropriate to specific problems, and plan strategies for their solution.
<b>A5.</b>	The extent to which a computer-based system meets the criteria defined for its current use and future development.
<b>A6.</b>	The current and underlying technologies that support computer processing and inter-computer communication.
<b>A7.</b>	Principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.
<b>A8.</b>	Management and economics principles relevant to computing and information disciplines.
<b>A9.</b>	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.
<b>A10.</b>	Current developments in computing and information research.
<b>A11.</b>	Requirements, practical constraints, and computer-based systems.
<b>A12.</b>	Essential mathematics relevant to computer science.
<b>A13.</b>	Using of high-level programming languages.
<b>A14.</b>	Demonstrating basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.
<b>A15.</b>	Interpreting and analyzing data qualitatively and/or quantitatively.
<b>A16.</b>	The principles and techniques of several application areas informed by the research directions of the subject, such as artificial intelligence, natural language processing, data mining, databases, and computer graphics.
<b>A17.</b>	Showing a critical understanding of the principles of artificial intelligence, image, and pattern recognition.
<b>A18.</b>	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.
<b>A19.</b>	Selecting 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.

### 2.3.2 Intellectual skills:

<b><u>By the end of the program, students should be able to:</u></b>	
<b>B1.</b>	Analyze computing problems and provide solutions related to the design and construction of computing systems.
<b>B2.</b>	Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.
<b>B3.</b>	Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.
<b>B4.</b>	Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.
<b>B5.</b>	Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.
<b>B6.</b>	Evaluate the results of tests to investigate the functionality of computer systems.
<b>B7.</b>	Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact
<b>B8.</b>	Familiar with the professional, legal, moral, and ethical issues relevant to the computing industry.
<b>B9.</b>	Evaluate research papers in a range of knowledge areas
<b>B10.</b>	Define traditional and nontraditional problems, set goals towards solving them, and. observes results.
<b>B11.</b>	Perform comparisons between (algorithms, methods, techniques...etc.).
<b>B12.</b>	Perform classifications of (data, results, methods, techniques, algorithms. etc.).
<b>B13.</b>	Identify attributes, components, relationships, patterns, main ideas, and errors.
<b>B14.</b>	Summarize the proposed solutions and their results.
<b>B15.</b>	Restrict solution methodologies upon their results.
<b>B16.</b>	Establish criteria and verify solutions.
<b>B17.</b>	Identify a range of solutions and critically evaluate and justify proposed design solutions.
<b>B18.</b>	Solve computer science problems with pressing commercial or industrial constraints.
<b>B19.</b>	Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.

### **2.3.3 Professional & practical skills:**

<b><u>By the end of the program, students should be able to:</u></b>	
<b>C1.</b>	Operate computing equipment, recognizing its logical and physical properties, capabilities, and limitations.
<b>C2.</b>	Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems.
<b>C3.</b>	Deploy the equipment and tools used for the construction, maintenance, and documentation of computer applications.
<b>C4.</b>	Apply computing information retrieval skills in computing community environment and industry.
<b>C5.</b>	Develop a range of fundamental research skills, using online resources, technical repositories and library-based material
<b>C6.</b>	Design, implement, maintain, and manage software systems.
<b>C7.</b>	Assess the implications, risks or safety aspects involved in the operation of computing equipment within a specific context.
<b>C8.</b>	Handle a mass of diverse data, assess risk and draw conclusions.
<b>C9.</b>	Use appropriate programming languages, web-based systems and tools, design methodologies, and knowledge and database systems.
<b>C10.</b>	Communicate effectively by oral, written, and visual means.
<b>C11.</b>	Perform independent information acquisition and management, using scientific literature and Web sources.
<b>C12.</b>	Prepare and present seminars to a professional standard.
<b>C13.</b>	Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy.
<b>C14.</b>	Specify, design, and implement computer-based systems.
<b>C15.</b>	Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
<b>C16.</b>	Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.
<b>C17.</b>	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.
<b>C18.</b>	Apply and manage the need for continuing professional and practical development in recognition of the need for life long-learning.



### **2.3.4 Transferable skills & personal qualities:**

<b><u>By the end of the program, students should be able to:</u></b>	
<b>D1.</b>	Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.
<b>D2.</b>	Demonstrate skills in group working, team management, time management and organizational skills.
<b>D3.</b>	Show the use of information-retrieval.
<b>D4.</b>	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.
<b>D5.</b>	Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.
<b>D6.</b>	Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.
<b>D7.</b>	Show the use of general computing facilities.
<b>D8.</b>	Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.

### **2.4 Program's Academic Reference 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 in October 2010.

### **2.5 Curricula Contents for Computing and Information Disciplines**

**Time Allowed for the program:** minimum of 4 years for normal student to complete the program.

**Table 1:** Indicative curricula content by subject area

Subject Area		Credits	Program(s) %	NARS Tolerance %
1	Humanities, ethical and Social Science	14	10.45	8-10
2	Mathematics and Basic Science	21	15.67	16-18
3	Basic Computing Science	27	20.15	26-28
4	Applied Computing Science	42	31.34	28-30
5	Training (zero credit) and Graduation Project	6	4.48	6-10
6	Optional (Institution character-identifying subjects)	24	17.91	16-4
<b>Total</b>		<b>134</b>	<b>100%</b>	

### 2.5.1 Structure of the program

The department uses the Credit Course System which is based on the credit units. Students should complete 49 modules, total of 134 credit hours summarized as follows:

- 7 modules (Institute Requirements) (14 credit hours) (10.45%)
- 7 modules (Institute Requirements) (21 credit hours) (15.67 %)
- 275 modules (Departmental Compulsory) (69 credit hours) (51.49 %)
- 8 modules (Departmental Electives) (24 credit hours) (17.91 %)
- 2 modules (graduation project) (6 credit hours) (4.48%)

#### Number of Contact Hours/Credits

Lecture	Exercise	Lab	Total
94	14	66	174

The Department covers the Computer Science program from the areas listed below:

1. **Programming Fundamentals**
2. **Theory / Languages**
3. **Architecture / Operating Systems**
4. **Net-Centric Computing**
5. **Intelligent Systems**
6. **Information Management**
7. **Human Computer Interaction / Graphics / Applications**
8. **Professional Practice**
9. **Project / Training / Special Topics**

### Level 1

Compulsory		Requirements	Credits
<b>First Semester</b>			
H 101	Communication Skills	n/a	2
BS 101	Calculus	n/a	3
CS 101	Intro. to Computer Science	n/a	3
H 102	English Language	n/a	2
H 103	Business administration	n/a	2
BS 104	Electronics	n/a	3

Compulsory		Requirements	Credits
BS 202	Physics	n/a	3
<b><u>Second Semester</u></b>			
BS 102	Linear Algebra	BS 101	3
CS 102	Computers Programming	CS 102	3
CS 104	Introduction to information systems	CS 101	3
BS 105	Statistics and Probabilities	BS 101	3
BS 201	Operations Research	BS 101	3
<b><u>Elective courses (optional)</u></b>			
None			

## Level 2

Compulsory		Requirements	Credits
<b><u>First Semester</u></b>			
BS 103	Discrete Mathematics	BS 101	3
CS 103	Object-Oriented Programming	CS 102	3
H 202	Human Rights	n/a	2
CS 202	Systems Analysis and Design	CS 104	3
CS 203	File Processing	CS 102	3
CS 306	Computer Architecture	BS 104	3
<b><u>Second Semester</u></b>			
H 201	Work Ethics	n/a	2
CS 201	Data Structures	CS 103	3
H 203	Technical Report Writing	H 102	2
H 204	Quality Assurance & Control	n/a	2
CS 204	Introduction to databases	CS 104	3
CS 205	Fundamentals of Multimedia	CS 103	3
CS 301	Assembly Language	CS 102	3
<b><u>Elective courses (optional)</u></b>			
None			

## Level 3

Compulsory		Requirements	Credits
<b><u>First Semester</u></b>			
CS 303	Logic Programming	CS 102	3
CS 304	Analysis of Algorithms	CS 201	3
CS 305	Software Engineering	CS 202	3
CS 307	Theory and Design of Compilers	CS 306	3
CS 310	Computer Networks	CS 101	3

Compulsory		Requirements	Credits
<b><u>Second Semester</u></b>			
CS 308	Computer Graphics	CS 103	3
CS 309	Mobile App Development	CS 302	3
CS 403	Artificial Intelligence	CS 304	3
CS 404	Theory of Operating Systems	CS 306	3
CS 300	Selected Topics in computer science - level 3	To be determined	3
<b><u>Elective courses (optional)</u></b>			
* Elective (3)	CS 321	Simulation and Modeling (3)	
	CS 332	Data warehouses (3)	
	CS 333	Decision support systems and applications (3)	
	CS 335	Multimedia Information Systems (3)	
	CS 334	Object Oriented Database (3)	
	CS 322	Computer Arabization (3)	
	CS 323	Natural language processing (3)	
	CS 324	Open-Source System Development (3)	
	CS 325	Human Computer Interaction (3)	
	CS 330	Information Visualization (3)	
	CS 331	Knowledge Representation and Reasoning (3)	
	CS 340	Network Security (3)	
	CS 341	Internet of Things (IoT) (3)	
	CS 342	E-learning (3)	
CS 343	Digital signal processing (3)		

#### Level 4

Compulsory		Requirements	Credits
<b><u>First Semester</u></b>			
CS 402	Digital Image Processing	CS 103	3
CS 498	Senior Project 1	CS 202	3
CS 400	Selected Topics in computer science - level 4	To be determined	3
<b><u>Second Semester</u></b>			
CS 302	Web Programming	CS 102	3
CS 401	Dynamic Languages	CS 103	3
CS 499	Senior Project 2	CS 498	3
<b><u>Elective courses (optional)</u></b>			
* Elective (4)	CS 320	Machine Learning (3)	
	CS 423	Intelligent Quantum Computers (3)	
	CS 425	Neural Networks (3)	
	CS 430	Data Mining (3)	
	CS 443	Pattern recognition (3)	
	CS 444	Virtual Reality (3)	
	CS 434	Geographical Information Systems (3)	

<b>Compulsory</b>		<b>Requirements</b>	<b>Credits</b>
	CS 435	E-banking (3)	
	CS 424	Bioinformatics Systems (3)	
	CS 431	Web Info Systems (3)	
	CS 432	XML Database (3)	
	CS 433	E-Commerce (3)	
	CS 420	Parallel processing (3)	
	CS 421	Computer Vision Systems (3)	
	CS 422	Genetic Algorithms (3)	
	CS 426	Computer Animation (3)	
	CS 441	Real Time Systems(3)	
	CS 344	Network operating systems (3)	
	CS 345	Wireless and mobile communication (3)	
	CS 440	Distributed Systems (3)	
	CS 442	Data Communication (3)	
	CS 445	Cloud Computing (3)	

### **2.5.2 Total program courses:**

<b>Compulsory</b>	<b>Electives</b>	<b>Total</b>
<b>41/ 110 Cr.</b>	<b>8 / 24 Cr.</b>	<b>49 / 134 Cr.</b>

## **2.6 Curriculum Progression**

### **2.6.1 Intended learning outcomes for each Level:**

<b>Level</b>	<b>Educational Objectives based on ILOs for each level</b>
<b>Level 1</b>	The curriculum is designed to have a broad-based structure, which utilizes the knowledge of the new entrants to build a strong foundation through Introductory Level modules. Mathematical and fundamental computer skills are emphasized early to prepare for more rigors later. Mathematical, physics, and computer skills are used to develop knowledge, understanding, and intellectual skills. In addition, other University-based modules help improve students' skills in the English language and social/cultural/ humanities issues.
<b>Level 2</b>	The aim of the core modules taught at this level is to prepare students for more complex and specialist work which could be studied at a later stage. Nevertheless, wide coverage of the topics is necessary to enable choice and coherence of the curriculum. The core modules that could form the Intermediate Level modules are designed for this purpose. Intellectual skills may be developed through these modules by solving problems, writing programs, developing small software systems, etc. The faculty requirements that include essential transferable skills, creative thinking, and ethical issues contribute to relevance and breadth.

Level	Educational Objectives based on ILOs for each level
<b>Level 3</b>	As the students' progress to the third and final levels, they should be well-informed about the overall subject area and mature enough to make informed choices. The curriculum structure has clearly defined prerequisites and displays pathways providing some specializations, e.g., Artificial Intelligence, Software Engineering, etc. Third-year modules help develop students' cognitive abilities and skills for programming in different platforms, theoretical aspects, modeling, building computer-based systems, problem-solving by analyzing criteria and specifications appropriate to certain problems and report writing. It is, however, important to realize that theoretical studies must be supported with practical and real-life professional experience. Other generic skills must also be developed. This is achieved by organizing suitable work experience in the industry for the students in the practical training module. The elective modules in the 3rd and 4th years allow some flexibility for the student
<b>Level 4</b>	The final level allows more flexibility for the student by providing the graduation project and other Advanced Level modules. The graduate project is of cardinal importance as it represents an amalgam of various skills and key components of the program learned so far by the student. It encourages the student to exercise flair and originality and demands strong commitment from him/her. Suitable project supervision ensures that the student is given guidance and support when required. However, the ethos of self-reliance and research has to be paramount. Regular maintenance of documentation and communication develops written and oral skills. With advanced modules, an appropriate depth of knowledge reflects the staff's research interest and stimulates students to take the opportunity to develop their intellectual abilities.

### 2.6.2 Detailed curricula content by subject credit/contact hours:

**Table (1)** Detailed curricula content by subject vs Subject Area according to NARS

Course code	Course name	Number of Hours		Pre-requisite	Subject Area according to NARS					
		Lectures	Exercise/Practical		Hum. & Soc. Sc.	Basic Sciences	Basic Comp. Sciences	Applied Comp. Sciences	Project, Training, Practice	Optional (ICS)
H 101	Communication Skills	2	0	n/a	2	0	0	0	0	
BS 101	Calculus	2	2	n/a	0	2	2	0	0	
CS 101	Intro. to Computer Science	2	2	n/a	0	0	1	2	0	

Course code	Course name	Number of Hours		Pre-requisite	Subject Area according to NARS					
		Lectures	Exercise/Practical		Hum. & Soc. Sc.	Basic Sciences	Basic Comp. Sciences	Applied Comp. Sciences	Project, Training, Practice	Optional (ICS)
H 102	English Language	2	0	n/a	2	0	0	0	0	
H 103	Business administration	2	0	n/a	2	0	0	0	0	
BS 104	Electronics	2	2	n/a	0	3	1	0	0	
BS 202	Physics	2	2	n/a	0	3	1	0	0	
BS 102	Linear Algebra	2	2	BS 101	0	3	1	0	0	
CS 102	Computers Programming	2	2	CS 102	0	1	1	2	0	
CS 104	Introduction to information systems	2	2	CS 101	0	1	1	2	0	
BS 105	Statistics and Probabilities	3	0	BS 101	0	1	1	0	0	
BS 201	Operations Research	3	0	BS 101	0	0	2	2	0	
BS 103	Discrete Mathematics	3	0	BS 101	0	3	1	0	0	
CS 103	Object-Oriented Programming	2	2	CS 102	0	0	1	2	0	
H 202	Human Rights	2	0	n/a	2	0	0	0	0	
CS 202	Systems Analysis and Design	2	2	CS 104	0	1	1	2	0	
CS 203	File Processing	2	2	CS 102	0	0	1	2	0	
CS 306	Computer Architecture	2	2	BS 104	0	0	1	2	0	
H 201	Work Ethics	2	0	n/a	2	0	0	0	0	
CS 201	Data Structures	2	2	CS 103	0	0	1	2	0	
H 203	Technical Report Writing	2	0	H 102	2	0	0	0	0	
H 204	Quality Assurance & Control	2	0	n/a	0	2	0	0	0	
CS 204	Introduction to databases	2	2	CS 104	0	0	1	2	0	
CS 205	Fundamentals of Multimedia	2	2	CS 103	0	0	1	2	0	
CS 301	Assembly Language	2	2	CS 102	0	0	1	2	0	
CS 302	Web Programming	2	2	CS 102	0	0	1	2	0	
CS 304	Analysis of Algorithms	2	2	CS 201	0	1	1	2	0	
CS 305	Software Engineering	2	2	CS 202	0	0	2	2	0	

Course code	Course name	Number of Hours		Pre-requisite	Subject Area according to NARS					
		Lectures	Exercise/Practical		Hum. & Soc. Sc.	Basic Sciences	Basic Comp. Sciences	Applied Comp. Sciences	Project, Training, Practice	Optional (ICS)
CS 307	Theory and Design of Compilers	2	2	CS 306	0	0	1	2	0	
CS 310	Computer Networks	2	2	CS 101	0	0	2	2	0	
CS 308	Computer Graphics	2	2	CS 103	0	0	1	2	0	
CS 309	Mobile App Development	2	2	CS 302	0	0	2	2	0	
CS 403	Artificial Intelligence	2	2	CS 304	0	0	1	2	0	
CS 404	Theory of Operating Systems	2	2	CS 306	0	0	1	3	0	
CS 402	Digital Image Processing	2	2	CS 103	0	0	1	3	0	
CS 498	Senior Project 1	2	2	CS 202	0	0	0	0	3	
CS 303	Logic Programming	2	2	CS 102	0	0	1	3	0	
CS 401	Dynamic Languages	2	2	CS 103	0	0	2	2	0	
CS 499	Senior Project 2	2	2	CS 498	0	0	0	0	3	
CS 300	Selected Topics in computer science - level 3	2	2	To be determined	0	0	1	3	0	
CS 320	Machine Learning	2	2	CS 202	0	0	0	0	0	3
CS 321	Simulation and Modeling	2	2	CS 103	0	0	0	0	0	3
CS 322	Computer Arabization	2	2	CS 304	0	0	0	0	0	3
CS 323	Natural language processing	2	2	CS 103	0	0	0	0	0	3
CS 324	Open-Source System Development	2	2	CS 103	0	0	0	0	0	3
CS 325	Human Computer Interaction	2	2	None	0	0	0	0	0	3
CS 330	Information Visualization	2	2	CS 104	0	0	0	0	0	3
CS 331	Knowledge Representation and Reasoning	2	2	CS 201	0	0	0	0	0	3
CS 332	Data warehouses	2	2	CS 204	0	0	0	0	0	3
CS 333	Decision support systems and	2	2	BS 201	0	0	0	0	0	3



Course code	Course name	Number of Hours		Pre-requisite	Subject Area according to NARS					
		Lectures	Exercise/Practical		Hum. & Soc. Sc.	Basic Sciences	Basic Comp. Sciences	Applied Comp. Sciences	Project, Training, Practice	Optional (ICS)
	applications									
CS 334	Object Oriented Database	2	2	CS 204	0	0	0	0	0	3
CS 335	Multimedia Information Systems	2	2	CS 205	0	0	0	0	0	3
CS 340	Network Security	2	2	CS 310	0	0	0	0	0	3
CS 341	Internet of Things (IoT)	2	2	CS 310	0	0	0	0	0	3
CS 342	E-learning	2	2	CS 310	0	0	0	0	0	3
CS 343	Digital signal processing	2	2	CS 103	0	0	0	0	0	3
CS 344	Network operating systems	2	2	CS 310	0	0	0	0	0	3
CS 345	Wireless and mobile communication	2	2	CS 310	0	0	0	0	0	3
CS 400	Selected Topics in computer science - level 4	2	2	To be determined	0	0	0	3	0	
CS 420	Parallel processing	2	2	CS 301	0	0	0	0	0	3
CS 421	Computer Vision Systems	2	2	CS 103	0	0	0	0	0	3
CS 422	Genetic Algorithms	2	2	CS 304	0	0	0	0	0	3
CS 423	Intelligent Quantum Computers	2	2	BS 102	0	0	0	0	0	3
CS 424	Bioinformatics Systems	2	2	CS 304	0	0	0	0	0	3
CS 425	Neural Networks	2	2	CS 304	0	0	0	0	0	3
CS 426	Computer Animation	2	2	CS 308	0	0	0	0	0	3
CS 430	Data Mining	2	2	CS 304	0	0	0	0	0	3
CS 431	Web Info Systems	2	2	CS 302	0	0	0	0	0	3
CS 432	XML Database	2	2	CS 204	0	0	0	0	0	3
CS 433	E-Commerce	2	2	CS 302	0	0	0	0	0	3

Course code	Course name	Number of Hours		Pre-requisite	Subject Area according to NARS					
		Lectures	Exercise/Practical		Hum. & Soc. Sc.	Basic Sciences	Basic Comp. Sciences	Applied Comp. Sciences	Project, Training, Practice	Optional (ICS)
CS 434	Geographical Information Systems	2	2	CS 204	0	0	0	0	0	3
CS 435	E-banking	2	2	CS 435	0	0	0	0	0	3
CS 440	Distributed Systems	2	2	CS 310	0	0	0	0	0	3
CS 441	Real Time Systems	2	2	CS 306	0	0	0	0	0	3
CS 442	Data Communication	2	2	CS 310	0	0	0	0	0	3
CS 443	Pattern recognition	2	2	CS 304	0	0	0	0	0	3
CS 444	Virtual Reality	2	2	CS 308	0	0	0	0	0	3
CS 445	Cloud Computing	2	2	CS 310	0	0	0	0	0	3
<b>Total</b>					<b>12</b>	<b>23</b>	<b>36</b>	<b>57</b>	<b>6</b>	<b>24</b>
					<b>8%</b>	<b>16%</b>	<b>27%</b>	<b>29%</b>	<b>6%</b>	<b>14%</b>
<b>Percentage according to NARS requirements</b>					<b>8-10%</b>	<b>16-18%</b>	<b>26-28%</b>	<b>28-30%</b>	<b>6-10%</b>	<b>16-4%</b>

## **2.7 CURRICULUM MAP OF COURSE UNITS AGAINST INTENDED LEARNING OUTCOMES OF THE CS-PROGRAM**

**(Attached, A3 matrix for CS program ILOs)**

**Table 2: CS Program's courses and ILOs Matrix**

Code	Course	Knowledge (A)	Intellectual (B)	Prof&Practical (C)	Transfer (D)
H 101	Communication Skills	1,3,9	2,4,8	1,3,6	2,4
BS 101	Calculus	16,17,18	10,11,12	9,14	1,2,3
CS 101	Intro. to Computer Science	1,2,9,10	2,3,8,9	5,1,3	3,7
H 102	English Language	1,2,4	2,3,5	10,11,12	2,6
H 103	Business administration	1,3,9	2,4,8	1,3,6	2,4
BS 104	Electronics	12,14,15,18,19	11,12,13,14,15	11,14	1,3,2,4
BS 202	Physics	1,4,6,8,9,11,14	1,12,13	4,16	1,2,8
BS 102	Linear Algebra	1,3,11,12,14,16	9,11,12,17	11,8,15	1,2,3
CS 102	Computers Programming	3,4,7,9,10	1,2,5,8,9,11	2,6,9	2,7
CS 104	Introduction to information systems	1,4,11,14	1,2,12,13	4,16	1,2
BS 105	Statistics and Probabilities	12,14	9,11,12,17	11,12,15	1,2,3
BS 201	Operations Research	1,2,3,4,6,11	5,7,10	2,4,9	3,5,7
BS 103	Discrete Mathematics	1,3,11,12,14	9,11,12	11,15	1,2,3
CS 103	Object-Oriented Programming	1,2,7	1,5,6,12	6,8,9	3,7
H 202	Human Rights	2,4,9	2,5,6	2,4,8	5,7,8
CS 202	Systems Analysis and Design	1,3,10,11,13,18	1,5,10,11,14,15,17	6,9,13,14,16,18	2,3,7
CS 203	File Processing	1,6,18,19	2,13,17	4,14,15,16	3,4
CS 306	Computer Architecture	2,5,6,11	4,5,7,9	5,7,11	1,2,8
H 201	Work Ethics	2,3,4,9	2,5,6,8,9,12	2,4,5,8	5,7,8
CS 201	Data Structures	1,3,10,11	4,11,12	3,8,9	3,5,7
H 203	Technical Report Writing	1,9,10	5,8,9	10,11,12	1,2,6
H 204	Quality Assurance & Control	1,3,5,7,11	1,3,5,6,13	1,2,4,13	1,2,3
CS 204	Introduction to databases	1,2,3,7	3,4,10	2,4,6,8,9	3,5
FT 201	Field Training	6,9,11	1,3,13,15	2,4,9,13,14,15,16,17,18	4,6,8
CS 205	Fundamentals of Multimedia	11,13,16,17	7,12,16,18,19	1,3,9,12,16,17	1,2
CS 301	Assembly Language	2,5,6,7,10,11	3,4,7,9,13	1,5,7	2,8
CS 302	Web Programming	1,2,3,7,10	1,5,6,7,8,13	3,6,7,9	1,7
CS 304	Analysis of Algorithms	2,7,13,15,18	4,7,10,11,16,19	2,4,6,9,13,14,15,16	2,3,8
CS 305	Software Engineering	4,5,7,10,11	8,10,11,13	3,6,7	2,7,8
CS 307	Theory and Design of Compilers	1,3,5,7,19	1,6,11,12,14	1,2,6,9	2,7
CS 310	Computer Networks	5,6,7,11	6,11,12	1,11,14	1,2,3
CS 308	Computer Graphics	3,6,11,13,16,19	2,7,9,13	6,9,12,16,17	1,4
CS 309	Mobile App Development	1,2,3,7,10	1,2,5,6,7,8,13	3,6,7,9	1,7
CS 403	Artificial Intelligence	13,16,17,18,19	10,11,12,14,17	9,11,14	1,2,3
CS 404	Theory of Operating Systems	3,5,10,11	3,4,6,8,9	1,3,7,5	1,8
CS 402	Digital Image Processing	2,4,8,13,17	8,10,13,16,19	1,3,7,9,11,14,16	1,4,7
CS 498	Senior Project 1	8,9,10,11,15,19	3,4,6,9,12,18,19	1,2,4,5,6,7,9,10,12-->18	1,2,3,4,6,8
CS 303	Logic Programming	1,2,3,13,16	1,2,5,13	2,3,5,9,14	2,4,6,7

Code	Course	Knowledge (A)	Intellectual (B)	Prof&Practical (C)	Transfer (D)
CS 401	Dynamic Languages	4,5,6,17,19	1,2,3,5,10,11,15	4,6,7,8,11,12,13,14	2,3,4,6,7,8
CS 499	Senior Project 2	8,9,10,11,19	3,4,6,7,8,9,18,19	1,2,4,5,6,7,9,10,12->18	1,2,4,6,8
FT 301	Field Training	6, 9, 11	1, 3,13, 15	2, 4, 9, 13, 14, 15, 16, 17, 18	4, 6, 8
CS 300	Selected Topics in computer science - level 3				
CS 320	Machine Learning	1,2,3,4,5,12,13,14,16,17,18,19	1,2,10,11,13,14,15,16,18	10,13,15,16	1,3,5,8
CS 321	Simulation and Modeling	2,7,19	5,6,11,15,18	2,3,9,10,17	2,5,7
CS 322	Computer Arabization	1,2,3,4, 5,10,12,13,14,15,16,17	1,2,3,4,5,8,9,10,11,16,14,15,18,19	1,2,3,4,6,7,8,9,10,11,12,13,17,18	2,3,4,5,6,7,8
CS 332	Data warehouses	1,2,3,7	3,4,10	2,4,6,8,9	3,5
CS 323	Natural Language Processing	1,15,16	1,4,17	6,9	2,4
CS 324	Open-Source System Development	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
CS 325	Human Computer Interaction	1,2,3,4	5,6,7	8,9,10	1,2,3,4
CS 330	Information Visualization	1, 2, 3,4	5, 6, 7	8, 9, 10	1,2,3,4
CS 331	Knowledge representation and reasoning	4, 11, 14 ,16, 18	1, 4, 9, 19	6,9,11,15,18	1, 2, 3
CS 333	Decision support systems and applications	1,3,9,16	1,4,5,17	2,7,16,18	2,4,6
CS 334	Object Oriented Database	1,5,11,18,19	8,10,11,17,19	3,6,7,12,18	2,3,7
CS 335	Multimedia Information Systems	1,4,12,13	2,5,11	4,8,11,18	3,7
CS 340	Network Security	1,7,9,11,22,17,19	2,6,8,17,18	6,7,9,13,14	1,7,8
CS 341	Internet of Things (IoT)	1,2,4,5,6,9,11	2,3,7,8,9	2,3,7,9	2,4,7
CS 343	Digital signal processing	1,3,12	1,2,10	2,9	5,7
CS 344	Network operating systems	1,6,11,13,14,19	2,11,15,17	1,13,15,17,18	2,7
CS 345	wireless and Mobile Communication	1,6, 11, 14, 18,19	2, 11, 15, 17, 18,19	1, 13, 15,18	1, 7
CS 400	Selected Topics in computer science - level 4				
CS 420	Parallel processing	1,3,7,13,18,19	2,6,11,16,17,18	6,9,14,15	1,7
CS 421	Computer Vision Systems	2, 4, 5, 6, 7, 8, 9, 15, 16, 17, 19	3,5,10,11,15	4,6,8,14	3,4,5,7,8
CS 422	Genetic Algorithms	8,9,10,15,16,17,19	3,5,15	4,6,8,14	1,3,4,7
CS 424	Bioinformatics systems	3,5,7,10,15,16,19	5,7,15	6,8,14	1,2,4
CS 425	Neural Networks	13,15,16,17	6,12,13,14,15,16,17	2,6,9,14,15,18	2,7
CS 426	Computer Animation	2,7, 15,18	7,16,19	2,13, 16	2,8
CS 430	Data Mining	3,13,14	11,14,15,17	11,15,18,19	3,5
CS 431	Web Information Systems	1, 2, 3, 7, 10	1, 5, 6, 7, 8,13	3, 6, 7, 9	1, 7
CS 432	XML Databases	1,2, 7 ,10	1,2,7,8,13	3,6,9	1,7
CS 433	<i>E-Commerce</i>	2,4,5,6,7,8,17,19	1,2,3,5,10,11,12,15	4,6,8,11,12,13,14	3,4,8
CS 434	Geographical Information Systems	1,2,3,4,6,10,13,15,16,18	1,2,4,5,11,13,14	1,2,3,4,6,9,11,14	2,4,7,8

Code	Course	Knowledge (A)	Intellectual (B)	Prof&Practical (C)	Transfer (D)
CS 435	E-banking	1,2,3,5,7,10,11,12,15,16,18,19	5,7,15	6,8,14	5,6
CS 440	Distributed Systems	8,9,10,15,1,6,19	13,5,7,8,15	4,6,8,11,14	2,3,4,8
CS 441	Real Time System	10, 8,9	3, 5, 7	4,6,8	3,4,8
CS 442	Data Communication	1,3,4,5,6,7,8,9,10,14,15,18,19	1,2,3,4,9,11,13,16,17,1,9	3,8,1,0,18	1,2,6
CS 443	Pattern recognition	2,4,8,13,17	8,10,13,16,17	1,3,7,9,12,16	1,4,7
CS 444	Virtual Reality	1,3,7	2,11,12	8,14	1,2
CS 445	Cloud Computing	1,5,6,8,9,18,19	2,4,7,8,9,11,16	1,2,3,5,7	1,7

### 3. CRITERIA FOR ADMISSION

- The Computer Science Department, Tenth of Ramadan Higher Technological Institute, offers higher education in specialized programs with specific tuition fees determined by the Institute's Board of Directors annually. Students who have completed the Egyptian General Secondary School Certificate (Mathematics or Science Section) or its equivalent (such as IGCSE, American Diploma, certificates from other countries accredited by the Supreme Council of Universities in Egypt) benefit from this education. And those registered with the Computer Science Department through the National Coordination Office for the same year in which they obtained this certificate or its equivalent. The student continues his/her education if he/she meets the conditions imposed by the Egyptian Universities Law and these internal regulations.
- **Science stream students** must pass the course **Math 2** for high school mathematics students, and the time specified for holding the exam is set by The Computer Science department.
- The program in this Bylaw is offered with the Credit-Hour System.
- The Council of the Computer Science department, higher technological institute 10<sup>th</sup> of Ramadan, can award extra scholarships for students who have achieved a high GPA, or students with limited financial abilities, according to the rules announced by the Council every year.
- Students are allowed to register in the required courses to achieve the degree awarding requirements for the program. Any registered credit hours beyond the program required credit hours for any reason is charged the separate tuition fees decided by the department council every year at the year of registering the course.
- Students must register a minimum of 9 credit hours every main semester.

### 4. PROGRESSION AND ASSESSMENT REGULATIONS

- The minimum number of credit hours required for obtaining the Bachelor of Science Degree (B.Sc.) is 134 credit hours in no less than seven semesters.
- The marks of each course are distributed as percentages of the total score, divided into the semester class work (activities) of the course (20% by 10% for the lecture, 10% for the lab and/or exercises), the mid-term exam 10% for courses that have a final practical exam, and 20% for courses that do not have a final practical exam and 60% for the final written exam.
- The student's entry to the final exam requires achieving an attendance rate of no less than "75%" of the lectures and exercises in each course. If the student's absence - without an acceptable excuse - in one of the courses exceeds "25%", the department Council may deprive him of entering the

final exam, and he is given a score of "zero" in the final exam score for the course. However, if the student submits an excuse acceptable to the department Council (and in the period specified by the Council), a "W" grade is calculated for him in the course for which the excuse was presented.

- For the student to pass a course, **the minimum mark that must be earned in the final exam is 30% of the total exam marks**, otherwise the student will fail the course irrespective of the total marks he/she earned in the course, and he/she will get an (F) grade in this course.
- The student fails the course if he/she obtains an (F) grade (less than 50% of the course marks) or did not attend the final examination without submitting a prior excuse that is accepted by the Education and Student Affairs Committee and approved by the Council of the institute or was not allowed to attend the final examination because of exceeding the absence percentage or cheating ... etc.
- None-Credit courses are marked as Pass or Fail. The student gets a grade but does not contribute to the cumulative GPA. To pass the course, the student should get at least 50% of the course total marks. Passing all None-Credit courses in the program is a must for graduation.
- A student gets an academic probation if his/her cumulative GPA at any main semester is **less than 2.0** (excluding his first semester in the faculty).
- In this case, the max allowed hours to be registered during his/her academic probation is **15 CH**. Student and his/her guardians must be formerly informed by his academic probation.
- **A student will be dismissed from the Computer Science Department of the Higher Technological Institute if they obtain a cumulative GPA of less than 2.0 in four consecutive semesters or six separate semesters, excluding the summer semester.**
- The minimum number of students required to open a course is **15 students**. Course opening is subject to the availability of teaching staff and the proper allocation of facilities. The Programs Administration Board may provide exceptions to these limits if there is a necessity.
- The department regulations governing the Work and Attendance of students are given in the Student Guide 2022/2023. Full attendance is required at all lectures, laboratories, and any tutorials which may be scheduled. Completed laboratory work should be handed in on time. Attendance at laboratories and at many lectures is monitored and attendance registers kept.
- Absence for holidays is not permitted in term-time. The duty of the lecturer is to keep continuous review of the work and attendance of the students with whom he is concerned.
- If the rate of student absences, in a module, is greater than 25% (or 30% for student representing the department in sportive or cultural activities) of the completely accredited hours and the student has no acceptable justification, then this student is excluded from that module. If The Council of the higher technological institute 10<sup>th</sup> of Ramadan accepts the justifications of absence, then this student is mentioned as withdrawn without refunding the registration fees.

## 5. Teaching & Learning Methods Assessment

Method (tool)	Intended leaning outcomes assessed
Lectures, e-Learning , Brain storming, Discussions, Problem solving , Presentations, Tutorials.	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills.
Research and Reports, Site visit &.Self-learning	Professional Skills - General Skills.
Laboratories, Experiments & Projects.	Professional Skills - General Skills.

## 6. Student Assessment

Method (tool)	Intended leaning outcomes assessed
Written examinations, In-class questions	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills.
Reports, assignments, quizzes, and Online Quiz.	Knowledge and understanding
Graduation project	Professional Skills - General Skills.
Practical / Exercise Exam	Professional Skills - General Skills.

Table (3) shows the Teaching and Assessment Matrix that lists the modules' numbers and titles, their teaching and assessment strategies, and the assessment weights. Note modules are of 1/2/3/4 credit hours which are equivalent to 3 or more class contact lectures, lab, tutorials, and so on. This information is available in the Modules Handbook.

**Table 3:** Teaching and Assessment Matrix

Module Code and Name		Lecture		Laboratory		Tutorial		Assignments/ Projects, Quizzes, or other Marks %		Total	
		Hour/ week	Exam Mark %	Hour/ week	Lab. Mark %	Hour/ week	Tutorial Mark %	MT Exam	Lecture Work	Hour/ week	Assess. Mark %
H 101	Communication Skills	2	60	-	-	-	-	20	20	2	100%
BS 101	Calculus	2	60	-	-	2	10	20	10	4	100%
CS 101	Intro. to Computer Science	2	60	2	10	-	-	10	20	4	100%
H 102	English Language	2	60	-	-	-	-	20	20	2	100%
H 103	Business administration	2	60	-	-	-	-	20	20	2	100%
BS 104	Electronics	2	60	-	-	2	10	20	10	4	100%
BS 202	Physics	2	60	-	-	2	10	20	10	4	100%
BS 102	Linear Algebra	2	60	-	-	2	10	20	10	4	100%
CS 102	Computers Programming	2	60	2	10	-	-	20	20	4	100%
CS 104	Introduction to information systems	2	60	2	10	-	-	10	20	4	100%
BS 105	Statistics and	2	60	-	-	2	10	20	10	4	100%



Module Code and Name		Lecture		Laboratory		Tutorial		Assignments/ Projects, Quizzes, or other Marks %		Total	
		Hour/ week	Exam Mark %	Hour/ week	Lab. Mark %	Hour/ week	Tutorial Mark %	MT Exam	Lecture Work	Hour/ week	Assess. Mark %
	Probabilities										
BS 201	Operations Research	2	60	-	-	2	10	20	10	4	100%
BS 103	Discrete Mathematics	2	60	-	-	2	10	20	10	4	100%
CS 103	Object-Oriented Programming	2	60	2	10	-	-	10	20	4	100%
H 202	Human Rights	2	60	-	-	-	-	20	20	2	100%
CS 202	Systems Analysis and Design	2	60	2	10	-	-	10	20	4	100%
CS 203	File Processing	2	60	2	10	-	-	10	20	4	100%
CS 306	Computer Architecture	2	60	2	10	-	-	10	20	4	100%
H 201	Work Ethics	2	60	-	-	-	-	20	20	2	100%
CS 201	Data Structures	2	60	2	10	-	-	10	20	4	100%
H 203	Technical Report Writing	2	60	-	-	-	-	20	20	2	100%
H 204	Quality Assurance & Control	2	60	-	-	-	-	20	20	2	100%
CS 204	Introduction to databases	2	60	2	10	-	-	10	20	2	100%
CS 205	Fundamentals of Multimedia	2	60	2	10	-	-	10	20	4	100%
CS 301	Assembly Language	2	60	2	10	-	-	10	20	4	100%
CS 302	Web Programming	2	60	2	10	-	-	10	20	4	100%
CS 304	Analysis of Algorithms	2	60	2	10	-	-	10	20	4	100%
CS 305	Software Engineering	2	60	2	10	-	-	10	20	4	100%
CS 307	Theory and Design of Compilers	2	60	2	10	-	-	10	20	4	100%
CS 310	Computer Networks	2	60	2	10	-	-	10	20	4	100%
CS 308	Computer Graphics	2	60	2	10	-	-	10	20	4	100%
CS 309	Mobile App Development	2	60	2	10	-	-	10	20	4	100%
CS 403	Artificial Intelligence	2	60	2	10	-	-	10	20	4	100%
CS 404	Theory of Operating Systems	2	60	2	10	-	-	10	20	4	100%
CS 402	Digital Image Processing	2	60	2	10	-	-	10	20	4	100%
CS 498	Senior Project 1	2	60	2	10	-	-	10	20	4	100%
CS 303	Logic Programming	2	60	2	10	-	-	10	20	4	100%
CS 401	Dynamic Languages	2	60	2	10	-	-	10	20	4	100%
CS 499	Senior Project 2	2	60	2	10	-	-	10	20	4	100%

Module Code and Name		Lecture		Laboratory		Tutorial		Assignments/ Projects, Quizzes, or other Marks %		Total	
		Hour/ week	Exam Mark %	Hour/ week	Lab. Mark %	Hour/ week	Tutorial Mark %	MT Exam	Lecture Work	Hour/ week	Assess. Mark %
CS 300	Selected Topics in computer science - level 3	2	60	2	10	-	-	10	20	4	100%
CS 320	Machine Learning	2	60	2	10	-	-	10	20	4	100%
CS 321	Simulation and Modeling	2	60	2	10	-	-	10	20	4	100%
CS 322	Computer Arabization	2	60	2	10	-	-	10	20	4	100%
CS 323	Natural language processing	2	60	2	10	-	-	10	20	4	100%
CS 324	Open-Source System Development	2	60	2	10	-	-	10	20	4	100%
CS 325	Human Computer Interaction	2	60	2	10	-	-	10	20	4	100%
CS 330	Information Visualization	2	60	2	10	-	-	10	20	4	100%
CS 331	Knowledge Representation and Reasoning	2	60	2	10	-	-	10	20	4	100%
CS 332	Data warehouses	2	60	2	10	-	-	10	20	4	100%
CS 333	Decision support systems and applications	2	60	2	10	-	-	10	20	4	100%
CS 334	Object Oriented Database	2	60	2	10	-	-	10	20	4	100%
CS 335	Multimedia Information Systems	2	60	2	10	-	-	10	20	4	100%
CS 340	Network Security	2	60	2	10	-	-	10	20	4	100%
CS 341	Internet of Things (IoT)	2	60	2	10	-	-	10	20	4	100%
CS 342	E-learning	2	60	2	10	-	-	10	20	4	100%
CS 343	Digital signal processing	2	60	2	10	-	-	10	20	4	100%
CS 344	Network operating systems	2	60	2	10	-	-	10	20	4	100%
CS 345	Wireless and mobile communication	2	60	2	10	-	-	10	20	4	100%
CS 400	Selected Topics in computer science - level 4	2	60	2	10	-	-	10	20	4	100%
CS 420	Parallel processing	2	60	2	10	-	-	10	20	4	100%
CS 421	Computer Vision Systems	2	60	2	10	-	-	10	20	4	100%
CS 422	Genetic Algorithms	2	60	2	10	-	-	10	20	4	100%

Module Code and Name		Lecture		Laboratory		Tutorial		Assignments/ Projects, Quizzes, or other Marks %		Total	
		Hour/ week	Exam Mark %	Hour/ week	Lab. Mark %	Hour/ week	Tutorial Mark %	MT Exam	Lecture Work	Hour/ week	Assess. Mark %
CS 423	Intelligent Quantum Computers	2	60	2	10	-	-	10	20	4	100%
CS 424	Bioinformatics Systems	2	60	2	10	-	-	10	20	4	100%
CS 425	Neural Networks	2	60	2	10	-	-	10	20	4	100%
CS 426	Computer Animation	2	60	2	10	-	-	10	20	4	100%
CS 430	Data Mining	2	60	2	10	-	-	10	20	4	100%
CS 431	Web Info Systems	2	60	2	10	-	-	10	20	4	100%
CS 432	XML Database	2	60	2	10	-	-	10	20	4	100%
CS 433	E-Commerce	2	60	2	10	-	-	10	20	4	100%
CS 434	Geographical Information Systems	2	60	2	10	-	-	10	20	4	100%
CS 435	E-banking	2	60	2	10	-	-	10	20	4	100%
CS 440	Distributed Systems	2	60	2	10	-	-	10	20	4	100%
CS 441	Real Time Systems	2	60	2	10	-	-	10	20	4	100%
CS 442	Data Communication	2	60	2	10	-	-	10	20	4	100%
CS 443	Pattern recognition	2	60	2	10	-	-	10	20	4	100%
CS 444	Virtual Reality	2	60	2	10	-	-	10	20	4	100%
CS 445	Cloud Computing	2	60	2	10	-	-	10	20	4	100%

## 7. Evaluation of Program Intended Learning Outcomes

Evaluator	Tool	Sample
1- Senior students	Questionnaires	Min. 60%
2- Department Staff	Questionnaires at the end of the Semester	Min. 60%
3- Related Civil society	Questionnaires	Min. 30%
4- Internal Evaluator (QAC)	Visits/Meetings/Works hops	Report
5- External Evaluator (Examiner)	Reviewing Program & Courses	Report

