Template No (13)

Program Specification

(Year: 2024)

Ministry of Higher Education and Scientific Research

Institute: Higher Institute of Computer Science and Information Systems

Department: Computer Science Department

Program: Computer Science Program (Credit Hours System)

A- Basic information

1- Program Title: Computer Science Program
2- Program Type: Single
3- Corresponding Department: Computer Science Department
4- Program Coordinator: A. Prof. Naglaa M. Reda
5- Date of program approval: 6 / 4 / 2021

B- Professional Information

1. Program General Aims:

The general aims of the program are to:

1/1 Enable students to acquire and develop knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, networks, computer architecture and software-based systems.

1/2 Develop the students' ability to apply mathematical foundations, algorithmic principles, and computer science theory in modelling, design, implementation, and evaluation of computer-based systems.

1/3 Develop the students' ability to apply knowledge of mathematics, and science to real world problems; as well as to analyze and interpret data.

1/4 Provide students with the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic approaches.

1/5 Provide students with a sound understanding and how to apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, programming language, software libraries and user interface technique.

1/6 Provide students with a solid understanding of the concepts used in computer science to be able to pursue further learning, whether as graduate students or on their own.

1/7 Equip students with state-of-the-art knowledge and understanding of data structures, computer organization and architecture, programming language concepts, networks, artificial intelligence, graphics, human computer interfaces, databases, data mining and high-performance computing, with their computing requirements.

1/8 Give students the opportunity to deepen their technical expertise in designing, implementing, and evaluating a computer-based system, process, or program.

1/9 Develop students' ability to use knowledge and understanding in the modelling and design of computer-based systems in a way that demonstrates comprehension of the trade-off involved in design choices, employing parallelism and learning techniques.

1/10 Prepare students for working effectively in teams in designing and implementing software systems and to equip them with management skills to be able to carry out a work plan with minimal supervision.

1/11 Develop the students understanding of the key ethical issues and security affecting computer science and their responsibilities as computer science professionals.

1/12 Develop the students' ability to orally communicate ideas and concepts clearly and in an organized manner.

1/13 Produce graduates with the ability to engage in the lifelong learning and with the skills required for a professional career in a computer-based environment or for a research career in computer science.

Program aims	knowledge and Understanding Skills	Intellectual Skills	Professional and Practical Skills	Transferable skills
1/1	✓	✓	✓	✓
1/2		✓	✓	
1/3		✓	✓	
1/4	✓	✓	✓	
1/5	✓	✓	✓	✓
1/6	✓			✓
1/7	✓	✓	✓	✓
1/8		✓	✓	
1/9		✓	✓	
1/10	✓			✓
1/11		✓	✓	✓
1/12	✓			✓
1/13			✓	✓

2. Program Intended Learning Outcomes (ILOs)

2/1 knowledge and Understanding Skills:

On completion of this program graduates will be able to:

a1. Know the basics of Calculus, Economic and Management relevant to computer science.

a2. Identify and consider the basics of Electronics for Digital Design.

a3. Describe and model Mathematical problems, and Statistical methods.

a4. Know how to solve problems by programming and using simulation models.

a5. Understand the basics of Computer Systems.

a6. Explain the Problem-Solving techniques.

a7. Identify and consider the basics of Discrete Mathematics.

a8. Recognize Operating Systems designs and Computer Networks.

a9. Demonstrate the basics of Computer components.

a10. Describe the Data Analysis process.

a11. Identify the fundamentals of Pattern Recognition.

a12. Recognize Artificial Intelligent principles.

a13. Describe the basics of Computer Graphics.

a14. Describe the basics of Translators design.

a15. Outline the principles of Software Engineering.

a16. Describe Engineering process of Software production.

a17. Identify and consider the principles of Object-Oriented Programming.

a18. Demonstrate the logic of Digital Circuits.

a19. Identify and consider the principles of Information Systems and Internet Technologies.

a20. Identify and consider the principles of information technologies, and information storage/retrieval.

a21. Illustrate Data and Computer Security.

a22. Identify the fundamentals of Cryptography techniques.

a23. Recognize Machin Learning techniques and Big Data Analysis.

a24. Describe human-computer interfaces and techniques of interactions.

a25. Provide a deeper understanding of some aspects of advanced topics including artificial intelligence, and parallel and distributed computing.

2/2 Intellectual Skills:

On completion of this program the successful student will be able to:

b1. Analyze and assemble components.

b2. Select appropriate Mathematical method to solve a specific problem.

b3. Develop Analytical Skills.

b4. Formulate and test Concepts and Hypothesis.

b5. Apply Modelling and Simulation.

b6. Identify the potential and the limitations of Computers.

b7. Develop computer algorithms to solve different problems.

b8. Gather and assess relevant information, using abstract ideas to interpret it effectively.

b9. Design and implement Programming methods.

b10. Plan, conduct and present Software Projects.

b11. Design different Pattern Recognition techniques.

b12. Perform different techniques to accomplish desired goals and objectives.

b13. Gather, integrate, and evaluate data/information for problem solving.

b14. Examine, analyze and classify problems carefully and effectively.

b15. Design software solutions to real world problems.

b16. Classify/Represent different Data types and Data structures.

b17. Evaluate system architectures for distributed systems.

2/3 Skills:

2/3/1 Professional and Practical Skills

On completion of this program the successful student will be able to:

c1. Choose the appropriate Programming Language or Operating system.

c2. Deploy Communication Skills in team working or leading.

c3. Acquire information independently.

c4. Prepare Technical Reports and present Seminars effectively.

c5. Investigate and use Information Technology skills.

c6. Design and Develop computer-based systems.

c7. Evaluate systems in terms of quality attributes.

c8. Use Logical inference in problem solving.

c9. Apply principles of effective information management.

c10. Investigate different techniques of information retrieval.

c11. Develop an effective risk management plan.

c12. Detect safety aspects.

c13. Deploy tools for software/projects documentation.

c14. Make efficient design of human-computer interfaces.

c15. Design Webpages and Multimedia Systems based on the principles of human-computer interactions.

c16. Design and implement distributed system application using different techniques.

2/3/2 General skills:

On completion of this program the successful student will be able to:

d1. Practice Communication and Management skills.

d2. Practice Independent Learning techniques.

d3. Develop the act of getting people together.

d4. Follow Analytical and Creative Thinking.

d5. Use Modelling capability in software projects.

d6. Follow ethics in research and work.

d7. Specify the applied human rights.

d8. Clarify ideas formulation and presentation.

d9. Work effectively, independently or as a part of a team.

d10. Practice designing skills and Engineering skills for projects.

3. Program Academic Standards:

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

4. Benchmarks:

Procedures followed to ensure that study program is compatible with the adopted academic standards are:

4/1 The institute has a committee for educational affairs and education development headed by the institute's deputy for education and student affairs, and one of its main tasks is to monitor the extent to which educational programs are compatible with the adopted academic standards.

4/2 Internal review committees were formed from members of the Executive Committee of the Institute's Quality Assurance Unit to review the specifications of the Institute's specialized academic program and ensure that the targeted educational outcomes (ILOs) are consistent with the NARS reference standards.

5. Program Curriculum Structure and Constituents:

5/1 Program Curriculum Structure:

Program duration: 134 credit hours.

Program structure

- No. of credit hours of Compulsory (110), Elective (24)
- No. of program Levels (in credit-hours system): 4 levels.

The following table summarizes the program structure:

Subject Area	CS program %	Permissible percentage
Humanities and social sciences (University requirements)	**8%**	**8-10%**
Mathematics and basic science	**16%**	**16-18%**
Basic computing science (Institution requirements)	**28%**	**26-28%**
Applied computing science (specialization)	**28%**	**28-30%**
Projects and practical exercises	**6%**	**6-10%**
Specialized topics (determined by the program nature)	**14%**	**4-16%**
Total	**100%**	

5/2 Program Constituents:

The code for the department teaching the course:

CS: Computer Science,

BS: Basic Science,

H: Humanities.

Compulsory courses of the program per each level are:

First level:

Code	Course Title	متطلب	ساعة معتمدة	اسم المقرر	كود المقرر
H 101	English Language		2	اللغة الإنجليزية	إ ن 101
H 102	Intro to Ecology		2	مقدمة في علم البيئة	إ ن 102
H 103	Communication and Presentation Skills		2	مهارات الاتصال والعرض	إ ن 103
BS 101	Calculus		3	التفاضل والتكامل	ع أ 101
BS 102	Discrete Mathematics		3	الرياضيات غير المتصلة	ع أ 102
BS 103	Linear Algebra	BS 101	3	الجبر الخطي	ع أ 103
BS 104	Statistics and Probabilities	BS 101	3	إحصاء واحتمالات	ع أ 104
BS 111	Electronics		3	الكترونيات	ع أ 111
CS 101	Introduction to Computer Science		3	مقدمة في علوم الحاسب	ع ح 101
CS 102	Computer Programming	CS 101	3	برمجة الحاسبات	ع ح 102
CS 111	Introduction to Information Systems		3	مقدمة في نظم المعلومات	ع ح 111
CS 121	Logic Design	CS 101	3	التصميم المنطقي	ع ح 121

Second level:

Code	Course Title	متطلب	ساعة معتمدة	اسم المقرر	كود المقرر
H 204	Human Rights		2	حقوق الإنسان	إ ن 204
H 205	Work Ethics		2	أخلاقيات العمل	إ ن 205
BS 205	Differential Equations	BS 101	3	معادلات تفاضلية	ع أ 205
BS 206	Operations Research	BS 101	3	بحوث العمليات	ع أ 206
CS 203	Object-Oriented Programming	CS 102	3	البرمجة الشيئية	ع ح 203
CS 204	Web Programming	CS 102	3	برمجة الويب	ع ح 204
CS 212	File Processing	CS 102	3	معالجة الملفات	ع ح 212
CS 213	Database Design	CS 111	3	تصميم قواعد البيانات	ع ح 213
CS 214	Systems Analysis and Design	CS 111	3	تحليل وتصميم النظم	ع ح 214
CS 222	Computer Organization	CS 121	3	تنظيم الحاسبات	ع ح 222
CS 231	Data Structures	CS 102	3	هياكل البيانات	ع ح 231
CS 241	Fundamentals of Multimedia	CS 102	3	أساسيات الوسائط المتعددة	ع ح 241

Third level:

Code	Course Title	متطلب	ساعة معتمدة	اسم المقرر	كود المقرر
H 306	Business Administration		2	إدارة الأعمال	إ ن 306
H 307	Fundamentals of Economics		2	مبادئ الاقتصاد	إ ن 307
CS 323	Computer Architecture	CS 222	3	بنية الحاسب	ع ح 323
CS 332	Analysis of Algorithms	CS 231	3	تحليل الخوارزميات	ع ح 332
CS 333	Operating Systems	CS 222	3	نظم التشغيل	ع ح 333
CS 351	Computer Networks	CS 101	3	شبكات الحاسب	ع ح 351
CS 361	Artificial Intelligence	CS 332	3	الذكاء الاصطناعي	ع ح 361
CS 371	Software Engineering	CS 111	3	هندسة البرمجيات	ع ح 371

Fourth level:

Code	Course Title	متطلب	ساعة معتمدة	اسم المقرر	كود المقرر
CS 406	Mobile App Development	CS 204	3	تطوير تطبيقات الجوال	ع ح 406
CS 443	Computer Graphics	CS 102	3	الرسم بالحاسب	ع ح 443
CS 444	Digital Image Processing	CS 332	3	معالجة الصور الرقمية	ع ح 444
CS 452	Information Security	CS 351	3	أمن المعلومات	ع ح 452
CS 464	Machine Learning	CS 332	3	تعلم الآله	ع ح 464
CS 481	Graduation Project 1	> 94 cr.	3	مشروع التخرج 1	ع ح 481
CS 482	Graduation Project 2	CS 481	3	مشروع التخرج 2	ع ح 482

Elective courses of the program per each level are:

Third level:

Code	Course Title	متطلب	س	اسم المقرر	كود المقرر
BS 307	Numerical Analysis	BS 205	3	التحليل العددي	ع أ 307
BS 308	Sampling Methods	BS 104	3	طرق المعاينة	ع أ 308
BS 309	Real Analysis	BS 101	3	التحليل الحقيقي	ع أ 309
H 308	Technical Writing	H 101	2	الكتابة الفنية	إ ن 308
H 309	Marketing and Sales	H 103	2	تسويق ومبيعات	إ ن 309
CS 300	Selected Topics in computer science – Level 3	To be determined	3	موضوعات مختارة في علوم الحاسب - مستوى 3	ع ح 300
CS 305	Logic Programming	CS 102	3	البرمجة المنطقية	ع ح 305
CS 315	Computation Theory	BS 102	3	النظرية الحسابية	ع ح 315
CS 334	Human Computer Interaction	CS 102	3	طرق اتصال الإنسان بالحاسب	ع ح 334
CS 335	Modeling and Simulation	BS 104	3	النمذجة والمحاكاة	ع ح 335
CS 342	Digital Signal Processing	BS 205	3	معالجة الإشارات الرقمية	ع ح 342
CS 362	Data Mining	CS 332	3	التنقيب في البيانات	ع ح 362
CS 363	Neural Networks	CS 332	3	الشبكات العصبية	ع ح 363

Fourth level:

Code	Course Title	متطلب	س	اسم المقرر	كود المقرر
CS 400	Selected Topics in computer science – Level 4	To be determined	3	موضوعات مختارة في علوم الحاسب - مستوى 4	ع ح 400
CS 424	Parallel Processing	CS 323	3	المعالجة المتوازية	ع ح 424
CS 425	High Performance Computing	CS 323	3	الحوسبة عالية الأداء	ع ح 425
CS 426	Embedded Systems	CS 222	3	النظم المدمجة	ع ح 426
CS 436	Compilers	CS 333	3	المترجمات	ع ح 436
CS 445	Virtual Reality	CS 323	3	الواقع الافتراضي	ع ح 445
CS 450	**Advanced Topics in computer Networks & Security**	CS 351	3	موضوعات متقدمة في شبكات وأمن الحاسب	ع ح 450
CS 453	Internet of Things (IoT)	CS 351	3	انترنت الأشياء	ع ح 453
CS 454	Wireless Networks	CS 351	3	الشبكات اللاسلكية	ع ح 454
CS 455	Cloud Computing	CS 333	3	الحوسبة السحابية	ع ح 455
CS 456	Distributed Systems	CS 351	3	الأنظمة الموزعة	ع ح 456
CS 457	Computer Networks Security	CS 351	3	أمن شبكات الحاسب	ع ح 457
CS 460	Advanced Topics in Artificial Intelligence	CS 361	3	موضوعات متقدمة في الذكاء الاصطناعي	ع ح 460
CS 465	Deep Learning	CS 361	3	التعلم العميق	ع ح 465
CS 466	Computer Vision	CS 361	3	الرؤية بالحاسب	ع ح 466
CS 467	Natural Language Processing	CS 361	3	معالجة اللغات الطبيعية	ع ح 467
CS 468	Pattern Recognition	CS 361	3	التعرف علي الأنماط	ع ح 468
CS 469	Robotics Systems	CS 361	3	أنظمة الروبوت	ع ح 469
CS 470	Advanced Topics in Software Engineering	CS 371	3	موضوعات متقدمة في هندسة البرمجيات	ع ح 470

CS 472	Big Data Analysis	CS 332	3	تحليل البيانات الكبيرة	ع ح 472
CS 473	Software Quality Assurance	CS 371	3	ضمان جودة البرمجيات	ع ح 473
CS 474	Software Project Management	CS 371	3	إدارة مشاريع البرمجيات	ع ح 474
CS 475	Distributed Databases	CS 213	3	قواعد البيانات الموزعة	ع ح 475
CS 476	Software Development Methodologies	CS 371	3	منهجيات تطوير البرمجيات	ع ح 476

In addition to a training period of 240 hours in a specialization.

6. Program Admission Requirements:

- The program accepts students who have obtained a high school diploma in science (science-mathematics) according to the rules regulating that and set by the competent authority. As for high school students in the Science Division, they must pass Mathematics 2 within the time frame set by the competent authorities.
- The Institute may accept transfers to the program from students at corresponding institutes and colleges and from students registered on an old competition list at the same institute after conducting an academic clearing of the courses studied by the student applying for transfer. It is stipulated that a student who obtains 75% or more of the number of hours required for graduation should not be transferred in the final band, in accordance with the conditions. Approved by the Ministry of Higher Education.
- The student may transfer from one study program to another after conducting an academic clearing of the courses studied by the student applying for transfer, a maximum of two times during the period of study at the institute, without prejudice to the general rules of transfer.

7. Regulations of Program Completion:

The graduate of the program is awarded a bachelor's degree in computer science, which includes the specialized specializations licensed to the institute after accomplishing 134 credit hours and 240 hours training.

8. Students Assessments (Methods and Rules):

Method	What measured from the ILOs
Written exams	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills
Practical exams	Professional Skills - General Skills
Quizzes	Knowledge and Understanding - Intellectual Skills
Assignments	Knowledge and Understanding - Intellectual Skills- Professional Skills
Essays / Presentation	Knowledge and Understanding - Intellectual Skills- Professional Skills - General Skills
Graduation Projects	Professional Skills - General Skills
Training	Intellectual Skills - Professional Skills - General Skills

9. Program assessment methods:

Evaluator	Tool	Sample
1. **Senior students**	Questionnaires	
2. **Alumni**	Questionnaires	Not yet
3. **Stakeholders**	Questionnaires and Discussion	
4. **External Evaluator(s)**	Review Reports	

Program coordinator **Signature** **Date**

A. Prof. Naglaa M. Reda

Approved by the Dean: **Signature**

Prof. Abd El Wahab El Sammak