Academic Reference Standards (ARS)

Computer Science Program – Faculty of Science – Minia University

The Academic Reference Standards (ARS) for the Computer Science Program are synthesized from the NARS for Basic Sciences and the NARS for Computer Science Program (Computing and Information)

I. The Attributes of Computer Science Graduate

After successfully completing the Computer Science program, the graduate should be able to:

1. Demonstrate a solid foundation in core areas of computer science, including algorithms, data structures, computational theory, computer architecture, software systems, and modern computing fields.
2. Apply mathematical foundations, scientific principles, and computational theories to model, analyze, and solve complex scientific and real-world problems.
3. Formulate problems, develop hypotheses, and design scientifically sound computational solutions using appropriate algorithms, models, and techniques.
4. Collect, analyze, interpret, and present scientific and computational data using appropriate tools, techniques, and formats.
5. Design, implement, and evaluate computer-based systems, components, or processes while considering performance, trade-offs, and application requirements.
6. Apply principles of software engineering and utilize modern computing tools, techniques, and technologies (e.g., programming languages, libraries, data mining, and artificial intelligence) effectively.
7. Demonstrate strong analytical and critical thinking skills to evaluate algorithms, software systems, and alternative computational approaches.
8. Engage in scientific research activities, pursue postgraduate studies, and adopt lifelong learning to keep pace with advances in computing and science.
9. Recognize the role of computer science in societal development and apply solutions that consider ethical, environmental, economic, and safety constraints.
10. Communicate scientific and technical information effectively in written and oral forms in Arabic, English, or other languages.
11. Work effectively in multidisciplinary teams, demonstrating flexibility, leadership, decision-making skills, and adaptability to diverse and challenging environments.
12. Apply information technology tools and computational methods effectively to support scientific research and problem-solving across disciplines.

II. Academic Reference Standards (ARS) for Computer Science Program

a. Knowledge & Understanding

The Computer Science graduate should be able to:

a1 Demonstrate knowledge of mathematical, scientific, and computing principles.
a2 Understand programming, algorithms, and system architectures.
a3 Analyze and interpret qualitative and quantitative data.
a4 Understand advanced topics such as AI, data science, and computational systems.
a5 Recognize processes, mechanisms, and system structures.
a6 Understand tools, techniques, and methodologies used in computing and science.
a7 Appreciate the development and evolution of knowledge in the discipline.
a8 Relate computing solutions to real-world and environmental contexts.

b. Intellectual Skills

The Computer Science graduate should be able to:

b1 Define, analyze, and decompose problems.
b2 Classify and compare data, methods, and algorithms.
b3 Evaluate solutions and justify decisions.
b4 Apply critical thinking and reasoning.
b5 Interpret and analyze scientific data.
b6 Design innovative solutions under constraints.
b7 Integrate knowledge to test hypotheses and validate results.

c. Professional and Practical Skills

The Computer Science graduate should be able to:

c1 Design, implement, and evaluate computing systems.
c2 Use programming languages, tools, and modern technologies effectively.
c3 Conduct investigations and manage data using scientific approaches.
c4 Evaluate systems and solutions critically.
c5 Prepare professional technical reports and presentations.
c6 Apply information management and retrieval techniques.
c7 Apply human-computer interaction principles in system design.
c8 Identify risks and ensure safe and ethical system operation.

d. General and Transferable Skills

The Computer Science graduate should be able to:

d1 Communicate effectively (oral, written, visual).
d2 Work collaboratively and manage responsibilities.

d3 Think independently and solve problems systematically.
d4 Engage in lifelong learning and self-development.
d5 Use ICT tools effectively.
d6 Apply ethical, cultural, and social considerations.

III. Curriculum Structure for Computer Science Program

Code	Curriculum Area	Percentage	Tolerance	Mapping Source
A	Humanities, Ethics & Social Sciences	**8%**	7–10%	Computing (A) + Basic Sci (Humanities)
B	Mathematics & Basic Sciences	**20%**	18–22%	Computing (B) + Basic Sci (Basic Science)
C	Basic Computing Sciences	**24%**	22–26%	Computing (C)
D	Applied & Specialized Computing	**26%**	24–28%	Computing (D) + Basic Sci (Specialty)
E	Computer & IT Skills	**6%**	5–7%	Basic Sci (Computer & IT)
F	Training (Internship / Field Work)	**4%**	3–5%	Computing (E)
G	Graduation Project & Research	**6%**	5–7%	Computing (F) + Basic Sci (Research)
H	Electives / Institutional Character	**6%**	5–8%	Computing (G) + Basic Sci (Others)
Total		**100%**		

IV. Computer Science Program Graduate Attributes Traceability Matrix (NARS Aligned)

No.	ARS Graduate Attribute	Mapped NARS CS Attributes	Mapped NARS Basic Sciences Attributes
1	Fundamental knowledge in core computer science disciplines	CS-1, CS-8	BS-1.1.3
2	Apply mathematical and scientific principles in problem solving	CS-2, CS-3	BS-1.1.3, BS-1.1.5
3	Scientific problem formulation and solution development	CS-2, CS-4	BS-1.1.5
4	Data analysis, interpretation, and presentation	CS-3	BS-1.1.3, BS-1.1.4
5	Design and evaluation of computer-based systems	CS-4, CS-9, CS-10	
6	Application of software engineering and modern tools	CS-5, CS-6	BS-1.1.6
7	Analytical and critical thinking	CS-4	BS-1.1.5
8	Research engagement and lifelong learning	CS-7	BS-1.1.8
9	Awareness of societal, ethical, and environmental responsibilities		BS-1.1.1, BS-1.1.2
10	Effective communication skills		BS-1.1.9
11	Teamwork and multidisciplinary collaboration		BS-1.1.7
12	Use of IT in scientific and research contexts	CS-2, CS-5	BS-1.1.6

CS = Computer Science Program (Computing and Information)
BS = Basic Sciences

V. ILOS Traceability Matrix for Computer Science Program

CS (FS) Attribute	Description	CS (CI) Mapping	BS Mapping
a1	Math, science & computing principles	K1, K3, K7	1.2.1,1.2.2
a2	Programming, algorithms, architectures	K2, K7	1.2.1
a3	Data analysis & interpretation	K4	1.2.4
a4	Advanced topics (AI, DS)	K5, K6, K8	1.2.2
a5	Processes & system structures	K7	1.2.3
a6	Tools & methodologies	K7, P1	1.3.2
a7	Evolution of knowledge	K8	1.2.5
a8	Real-world context	I9	1.2.6
b1	Problem definition	I1, I4	1.4.4
b2	Classification & comparison	I2, I3	1.4.1
b3	Evaluate solutions	I8	1.4.3
b4	Critical thinking	I7, I8	1.4.3
b5	Interpret data	I5	1.4.2
b6	Innovative design	I9, I10	1.4.4
b7	Test hypotheses	I7	1.4.5
c1	System design	P7, P8	1.3.1
c2	Tools & programming	P1, P12	1.3.2
c3	Investigations & data	P3	1.3.1
c4	Evaluate systems	P8	1.3.4
c5	Reports & presentations	P4, P6	1.3.1
c6	Information retrieval	P9	1.5.7
c7	HCI principles	P10	
c8	Risk & ethics	P11	1.3.2,1.5.5
d1	Communication	P2, T6	1.5.4
d2	Teamwork	T2	1.5.2,1.5.4
d3	Independent thinking	T1	1.5.3
d4	Lifelong learning	T1, T8	1.5.6
d5	ICT use	T7	1.5.1
d6	Ethics & society	P11	1.5.5

CS (FS) = Computer Science Program (Faculty of Science)

CS (CI) = Computer Science Program (Computing and Information)

BS = Basic Sciences