



Faculty of  
Science



وحدة ضمان الجودة

إن جودة العلوم الأساسية هي الضمان  
للعلوم الأخرى



كلية العلوم

The Quality of Basic Sciences is the Assurance for  
Other Sciences

برنامج الرياضيات و علوم الحاسب

مرحلة البكالوريوس

٢٠٢٢/٢٠٢١

المحور الثاني

الفاعلية التعليمية

المعيار الأول

المعايير الأكاديمية للبرنامج



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|  |           |
|--|-----------|
| تبني البرنامج للمعايير الأكاديمية                    | ٢/١/٢     |
| معايير أخرى معتمدة                                   | ٢/٢/١/٢   |
| ما المعايير الأخرى التي تتبناها المؤسسة<br>للبرنامج؟ | ١/٢/٢/١/٢ |

This program adopts the National Academic Reference Standards (**NARS**) for basic sciences approved by the National Authority for Quality Assurance and accreditation of Education (**NAQAAE, 2008**) and followed by the academic standards (**ARS**) for the Mathematics and Computer Science program approved by the committee of the faculty of Science, Helwan University dated **January 2015**.

**National Academic Reference Standards (NARS) for basic Sciences** provide measures for the academic community to describe the nature and characteristics of academic programs in a certain field of specialty. They also represent the general expectations about the qualifications, attributes and capabilities that the graduates of those programs should be able to demonstrate. The following qualifications should be achieved by the science graduates to fit with the **NARS** level.

#### **A. General Attributes of the Graduates of Basic Sciences**

**The graduates must be able to:**

- A.1 Recognize the role of Basic Sciences in the development of society.
- A.2 Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements.
- A.3 Utilize scientific facts and theories to analyze and interpret practical data.
- A.4 Collect, analyze, and present data using appropriate formats and techniques.



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- A.5 Postulate concepts and choose appropriate solutions to solve problems on scientific basis.
- A.6 Apply effectively information technology relevant to the field.
- A.7 Participate effectively in a multidisciplinary teamwork and be flexible for adaptation, decision making and working under contradictory conditions as well as exhibiting the sense of beauty and neatness.
- A.8 Adopt self and long life-learning and participate effectively in research activities.
- A.9 Deal with scientific data in Arabic, English or other languages.

### **B. Knowledge and Understanding**

**Graduates must acquire knowledge and understanding of:**

- B.1 The related basic scientific facts, concepts, principles and techniques.
- B.2 The relevant theories and their applications.
- B.3 The processes and mechanisms supporting the structure and function of the specific topics.
- B.4 The related terminology, nomenclature and classification systems.
- B.5 The theories and methods applied for interpreting and analyzing data related to discipline.
- B.6 The developmental progress of the program-related knowledge.
- B.7 The relation between the studied topics and the environment.

### **C. Practical and Professional Skills**

**The graduates must be able to:**



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- C.1 Plan, design, process and report on the investigated data, using appropriate techniques and considering scientific guidance.
- C.2 Apply techniques and tools considering scientific ethics.
- C.3 Solve problems using a range of formats and approaches.
- C.4 Identify and criticize the different methods used in addressing subject related issues.

#### **D. Intellectual Skills**

**The graduates must be able to:**

- D.1 Differentiate between subject-related theories and assess their concepts and principles.
- D.2 Analyze, synthesize, assess and interpret qualitatively and quantitatively science relevant data.
- D.3 Develop lines of argument and appropriate judgments in accordance with scientific theories and concepts.
- D.4 Postulate and deduce mechanisms and procedures to handle scientific problems.
- D.5 Construct several related and integrated information to confirm, make evidence and test hypotheses.

#### **E. General and Transferable Skills**

**The graduates must be able to:**

- E.1 Use information and communication technology effectively.
- E.2 Identify roles and responsibilities, and their performing manner.
- E.3 Think independently, set tasks and solve problems on scientific basis.



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- E.4 Work in groups effectively; manage time, collaborate and communicate with others positively.
- E.5 Consider community linked problems, ethics and traditions.
- E.6 Acquire self- and long life-learning.
- E.7 Apply scientific models, systems, and tools effectively.
- E.8 Deal with scientific patents considering property right.
- E.9 Exhibit the sense of beauty and neatness

**Academic Reference Standards (ARS) for Mathematics & Computer Science program:**

**A. Attributes of a Graduate:**

**In addition to the general attributes of the graduate of Basic Sciences approved by the NAQAAE, the graduate of the Mathematics and Computer Science program should be able to:**

- A.1 Reveal a wide-ranging of the basic concepts and theories in the different branches of mathematics and computer science.**
- A.2 Use such knowledge and necessary skills to develop mathematical and computer science capabilities in modeling and designing of computer based systems.**
- A.3 Recognize and use various types of reasoning and methods of proof to find true statements**
- A.4 Create and use representations to model and interpret mathematical ideas.**
- A.5 Apply mathematical and computing knowledge and skills to draw conclusions and solve real life problems**
- A.6 Deal with mathematical and computer data about specific subjects appropriately in English and improve students' self and life-long learning skills in research activities.**
- A.7 Use effectively information technology relevant to the field of mathematics**



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and computer science.

**General Academic Standards:**

By the end of the Mathematics and Computer Science program, a typical graduate should be able to:

**B. Knowledge and Understanding:**

In addition to the general knowledge acquired by Basic Sciences graduates, the Mathematics and Computer Science graduates must be able to know and understand the:

- B.1 Numerical mathematics, and the different ways in which numerical information is used.
- B.2 Abstract algebraic structures and their roles in solving problems expressed with symbols and in developing mathematical and computer sciences theories and techniques.
- B.3 Mathematical and computer sciences methods and techniques that deal with differential equations and their applications analytically and numerically.
- B.4 Geometrical concepts, and processes used in measuring attributes of objects.
- B.5 The concept of function, and its role in mathematical and computer sciences analysis.
- B.6 Discrete mathematics, algorithms, and combinatorial abilities in order to solve problems of finite character and enumerate sets without direct counting.
- B.7 Probability and statistical models to make inferences about real-world application.
- B.8 The deductive nature of mathematics, and the roles of definitions, axioms, and theorems to identify and construct valid deductive arguments.
- B.9 Modeling and symbolic representations, solving problems.
- B.10 Programming concepts for various branches of mathematics.
- B.11 Appropriate theory, practices, and tools for the specification, design, implementation, and evaluation of a computer-based system.



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**B.12** How hardware and software are integrated to create computer systems and distinguish between selected forms of computer hardware architecture, and operating system technology.

**B.13** The principles and techniques of a number of application areas informed by the directions of the subject such as artificial intelligence, databases and computer graphics.

#### **C. Intellectual Skills:**

In addition to the intellectual skills acquired by Basic Sciences graduates, the graduates of the Mathematics and Computer Science program must be able to:

**C.1** Formulate mathematical ideas and procedures using appropriate mathematical, computer sciences vocabulary and notation.

**C.2** Use symbolic forms for modeling real-world situations based on provided knowledge of mathematical and computer science processes and use the models to make predictions and informed decisions.

**C.3** Solve abstract and mathematical models of computer and communication systems.

**C.4** Develop connections within branches of mathematics and computer sciences and other disciplines.

**C.5** Apply appropriate processes of applied mathematical and computer sciences studies in applications.

**C.6** Use skills in mathematical and computer sciences reasoning, manipulation and calculation.

**C.7** Manage information effectively to various types of information systems.

**C.8** Apply appropriate mathematical techniques to the development of software solutions.

#### **D. Practical and Professional Skills:**

In addition to the practical and professional skills acquired by Basic Sciences graduates, the graduates of the Mathematics and Computer Science program must be able to:



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- D.1 Apply reasoning techniques to build convincing mathematical argument.
- D.2 Develop conjectures and draw appropriate conclusions, and test these conjectures.
- D.3 Identify required mathematics, computer sciences and other technical information independently.
- D.4 Develop computer skills both at the software and hardware levels, database web graphics tools and techniques.
- D.5 Design computerized interfaces to implement programming problems based on upgraded packages.
- D.6 Apply technology to enhance mathematical and computer sciences thinking and understanding.
- D.7 Manipulate in a professional way with computer sciences and mathematical methods when solving and modeling problems.
- D.8 Develop and reinforce tenacity and confidence in their abilities to use mathematics and computer sciences.
- D.9 Compute based on symbolic and numerical software approximations for different types of numerical errors.
- D.10 Apply essential concepts, principles, and practices of computer science and mathematics, in the context of well-defined scenarios, showing judgment in the selection and application of tools and techniques.
- D.11 Specify, design, implement and upgrade computer-based systems.
- D.12 Recognize and be guided by the social, professional, and ethical issues involved in the use of computer technology.

#### E. General Skills:

The graduates of the Mathematics and Computer Science program must be able to:

- E.1 Use information and communication technology effectively.
- E.2 Identify roles and responsibilities, and their performing manner.
- E.3 Think independently, set tasks and solve problems on scientific basis.
- E.4 Work in groups effectively; manage time, collaborate and communicate





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**with others positively.**

- E.5 Consider community linked problems, ethics and traditions.**
- E.6 Acquire self- and long life-learning.**
- E.7 Apply scientific models, systems, and tools effectively.**
- E.8 Deal with scientific patents considering property right**
- E.9 Exhibit the sense of beauty and neatness.**