Menoufia University

Faculty of Science

B. Sc. Pure Mathematics and Computer Science Program

2023 / 2024

Program Specification

A- Basic Information

Program title:	**B.Sc. Pure Mathematics and Computer Science**
Program type	**Double**
Department (s):	**Mathematics and Computer Science**
Coordinator:	**Prof. Mohamed Abu-Shady**
External evaluator(s):	**Prof. Dr. Samir El-Mogi**
Last date of program specifications approval:	**September 2024**

B - Professional Information

ARS (Suggested by the Mathematics and Computer Science Department and approved by the Faculty Council since 2012) and updated on July 14, 2024

Program Aims:

(1)	**Provide the student with knowledge and skills in line with the standard academic criteria that qualify him to deal easily with the common fields in mathematics and computer science.**
(2)	**Provide the student with methods of mathematical logic and alternative ways of thinking to analyze and interpret data and solve problems.**
(3)	**Develop mathematics and computer science courses to prepare the student for a supportive educational and research environment.**
(4)	**Support and motivation for teamwork, self-development and lifelong learning.**
(5)	**Train the student on effective application of relevant information technology in the field of mathematics and computer science.**
(6)	**Motivate the student to participate in training activities and build an effective community partnership.**

1. Attributes of the graduate student

Graduates of this joint honors degree program will acquire a powerful combination of mathematical and computer science knowledge and skills. They will be in an ideal position to appreciate and exploit the role of mathematics in computing and the application of computing in mathematics.

The graduate students with the following skills:

1	Postulate concepts and choose appropriate solutions to solve problems on a scientific basis.
2	Demonstrate the ability to self-learn, learn lifelong and actively participate in research activities.
3	Reveal a wide range of background knowledge related to the different branches of mathematics and computer science.
4	Express the mathematical reasoning and alternative ways of thinking.
5	Understand how different mathematical branches are integrated to solve real-world problems.
6	Link between mathematics and computer science to solve diverse problems.
7	Apply mathematical, computing knowledge and programming skills in problem solving and modeling in professional practice.
8	Develop computer applications to meet desired needs within realistic constraints.
9	Develop appropriate knowledge and awareness of the importance and applications of mathematical and software development.
10	Gain sufficient knowledge of mathematics and computer science principles to be able to meet confidently in future developments in a rapidly changing area.

2- Intended learning outcomes (ILOs)

A. Knowledge and understanding

On completion of this program graduates should be able to:

A1	Demonstrate basic knowledge and understanding of the core ideas of mathematics and computer science.
A2	Express programming concepts for various branches of probability and mathematics.
A3	Explain mathematical and computing knowledge in solving different problems.
A4	Recognize how the hardware and software are integrated to create computer systems and distinguish between selected forms of computer hardware architecture, and operating system technology.

A5	Define the principles of mathematical modeling and application.
A6	Define appropriate theory, practices, and tools for the specification, design, implementation, and evaluation of a computer-based system.
A7	Comprehend relevant mathematical methods, physical laws and the principles of electrical science as applied to computer systems;
A8	Explain the meaning of complicated statements using mathematical notation and language.
A9	Specify 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 industry.
A10	Discuss a broad general education necessary to understand the impact of computer science solutions in a global and societal context.

B. Intellectual skills

On completion of this program graduates should be able to:

B1	Construct and solve abstract and mathematical models of computer and communication systems.
B2	Use the knowledge and understanding of the computational and mathematical processes for modeling real-world problems.
B3	Develop appropriate knowledge and awareness of the importance and applications of computational and mathematical assumptions.
B4	Apply appropriate computational and mathematical techniques to the Development of software solutions.
B5	Develop and evaluate logical arguments.
B6	Assemble ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.

C- Professional and practical skills

On completion of this program graduates should be able to:

C1	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.
C2	Apply the concepts and methods of computer science, and mathematics to the solution of the real problems in professional practice.
C3	Approximate of sources of numerical errors and usage of symbolic and numerical software as a part of practical computation.
C4	Demonstrate competence in the use of computational and mathematical methods in problem solving and modeling.

C5	Specify, design, implement and upgrade computer-based systems.
C6	Deploy the equipment and tools used for the construction, maintenance and documentation of computer applications.
C7	Practice a range of fundamental research skills, using online resources, technical repositories and library-based material.

D- General and transferable skills

On completion of this program graduates should be able to:

D1	Use information and communication technology effectively.
D2	Identify roles and responsibilities, delegate tasks, and set clear guidelines and performance indicators.
D3	Show independently and ability to make use of a range of learning resources to solve problems on a scientific basis.
D4	Employ discrete and continuous mathematical skills as appropriate.
D5	Work in a team effectively; manage time, collaborate and communicate with others positively.
D6	Exhibit appropriate numerical skills in understanding and presenting cases involving a quantitative and qualitative dimension.
D7	Address the community linked problems with considerable attention to the community ethics and traditions.
D8	Demonstrate self- and life-long learning.

3- Academic standards

ARS (Suggested by the Mathematics and Computer Science Department and approved by the Faculty Council since 2012) and updated on July 14, 2024

4- Curriculum Structure and Contents

4.a- Program duration………4 years

4.b- Program structure

4.b-i- No. of credit hours of mathematics courses 56 H 38.89 %

4.b-ii- No. of credit hours of Computer science courses 56 H 38.89%

4.b-iii- No. of credit hours from other departments 16 H 11.11 %

4.b-iv- No. of credit hours of faculty requirement 10 H 6.94 %

4.b-v- No. of credit hours of university requirement 6 H 4.17 %

Area	ARS Percentage	Tolerance	Program
Basic Science	28	27-29	40 hrs.
			27.78%
Humanities (including language)	6	5 - 7	9 hrs.
			6.25%
Specialty (Professional)	50	48-52	77 hrs.
			53.47%
Computer and IT	6	5 - 7	7 hrs.
			4.86%
Research and graduation project	2	1 - 3	2 hrs.
			1.39%
Others (Discretionary)	8	7 - 9	9 hrs.
			6.25%

5- Program Courses

a. Compulsory Courses

Mathematics Compulsory Courses

First Level

Course	Code	Hours			Prerequisite
		L	P	C	
Mathematical Analysis (1)	M111	2	2	3	----
Analytical Geometry (1)	M112	2	1	2.5	----
Algebra	M113	2	1	2.5	-----
Mathematical Analysis (2)	M114	3	2	4	M111
Analytical Geometry (2)	M115	2	1	2.5	M112
Abstract Algebra (1)	M116	2	1	2.5	M113
Linear Algebra	M117	2	1	2.5	M113
Numerical Analysis (1)	M118	2	1	2.5	M117

Second Level

Course	Code	Hours			Prerequisite
		L	**P**	**C**	
Mathematical Analysis (3)	**M 211**	2	2	3	**M 114**
Ordinary Differential Equations	**M 212**	2	1	2.5	**M 111**
Introduction in Differential Geometry.	**M215**	2	1	2.5	**M115**
Partial Differential equations	**M 216**	2	1	2.5	**M212- M117**
Numerical Analysis (2)	**M217**	2	1	2.5	**M118**
Principles of Statistics & Probability(1)	**M248**	1.5	1	2	**M111- M113**
Linear Programming	**M2218**	2	2	3	**M117**

Computer Science Compulsory Courses

First Level

Course	Code	Hours			Prerequisite
		L	**P**	**C**	
Introduction to Computer Programming	**M 139**	2	2	3	---------
Discrete Mathematics (1)	**M 1310**	2	2	3	--------
Structured Programming (1)	**M 1312**	3	2	4	**M139**

Second Level

Course	Code	Hours			Prerequisite
		L	**P**	**C**	
Computer Language	**M 2311**	3	2	4	**M1312**
Introduction to Computer Systems	**M 2312**	2	2	3	**M2311**
Data Structures	**M 2317**	3	2	4	**M2311**

Third Level

Course	Code	Hours			Prerequisite
		L	P	C	
Operating Systems	M 338	3	2	4	M2317
Database Systems	M 3310	3	2	4	M2317
Design and Analysis of Algorithms	M339	2	-	2	M2317

Fourth Level

Course	Code	Hours			Prerequisite
		L	P	C	
Computational Theory	M 438	2	-	2	M 2317
Computer Networks	M 437	3	-	3	M2312
Logic in Computer Science	M4316	3	2	4	

b. Elective Courses

Mathematics Elective Courses

Course	Code	Hours			Prerequisite
		L	P	C	
Relativity Theory (1)	M2210	2	1	2.5	M 229
Mathematical Methods (1)	M2217	2	1	2.5	M 211
Non–linear Programming	M2112	2	1	2.5	M 2118
Mathematical Analysis (4)	M213	2	1	2.5	M211
Abstract Algebra (2)	M214	2	1	2.5	M116
Introduction to Analysis and Topology	M311	3	1	3.5	M217
Real Analysis	M312	2	2	3	M213
Theory of a Complex Variable	M3114	2	-	2	M211
Differential Equations (3)	M 3116	3	-	3	M 216

Course	Code	L	P	C	Prerequisite
Operations Research	M317	2	-	2	M2118
Functional Analysis (1)	M 411	2	-	2	M213
Differential Geometry	M414	2	1	2.5	M 115-M 213
Theory of Finite Groups	M315	3	-	3	M214
General mechanics	M1213	3	2	4	-
Mathematical Logic	M316	2	-	2	M214
Functional Analysis (2)	M415	3	-	3	M311
Numerical Analysis (3)	M416	2	-	2	M217
Essay	M000	2	-	2	-

Computer Science Elective Courses

Course	Code	Hours			Prerequisite
		L	P	C	
File Systems	M2318	3	2	4	M2311
Assembly Language	M 2316	3	2	4	M 2317
Systems Analysis and Design	M 3311	3	2	4	M 1312
Advanced Programming Language	M 3312	3	-	3	M 2311
Programming Language Concepts	M 3313	3	-	3	M 2317
Software Engineering	M 439	3	2	4	M 2318
Computer Graphics	M 4310	2.5	-	2.5	M 2318
Advanced Operating System	M 4312	3	-	3	M 338
Principle of Compiler Design	M 4317	3	-	3	M 438
Artificial Intelligence	M 4315	3	-	3	M2317
Computer Vision	M4323	2	2	3	M 2315
Pattern Recognition	M4325	2	2	3	M 2315
Computational Geometry	M4326	2	2	3	M 2315
Image Processing	M4322	2	2	3	M 2315
Selection in Computers	M4313	3	-	3	-
Selected Topics	M 3314	3	-	3	M 2311
Essay	C000	2	-	2	-

c. Program requirements

Course	Code	Hours			Prerequisite
		L	P	C	
Principles of Inorganic Chemistry	**CH122**	1.5	1	2	-
Crystallography	**G111**	1.5	3	3	-
Principle of Physical Chemistry	**CH111**	2	2	3	-
Properties of Matter	**P111**	3	-	3	-
Waves and Acoustics	**P144**	3	-	3	-
Electromagnetic	**P145**	3	-	3	-
Applied Physics (1)	**P189**	-	6	3	-
Physical Geology	**G141**	1.5	3	3	-
Analytical Chemistry (1)	**CH134**	1.5	1	2	-

d. Faculty requirements

Compulsory

Course	Code	Hours			Prerequisite
		L	P	C	
English (1)	**F111**	1	-	1	-
English (2)	**F112**	1	-	1	**F111**

Elective Courses

Course	Code	Hours			Prerequisite
		L	P	C	
History of Science	**F110**	2	-	2	-
Islamic Studies (1)	**F121**	2	-	2	-
Photography & Microfilm	**F141**	2	-	2	-
Environmental Studies	**F151**	2	-	2	-
Egyptology & Monuments	**F181**	2	-	2	-

e. University requirements (compulsory courses)

Course	Code	Hours			Prerequisite
		L	P	C	
Computer (1)	U131	1	2	2	-
Computer (2)	U132	1	2	2	U131
Statistics	U133	1	-	1	-
مدخل إلي الجودة	U000	1	-	1	-
قضايا مجتمعية	U190	1	-	1	-

6- Program admission requirements

General secondary certificate (with Math. 2).

7- Regulations for progression and program completion

In accordance with the faculty bylaws.

- there are 4 study levels, and the pass percent is 60%

-Level 1: Student should attain 34 credit hours

-Level 2: Student should attain 68 credit hours

-Level 3: Student should attain less than 102 credit hours

-Level 4: Student should attain more than 102 credit hours.

More info are available from Articles (3-5) of the faculty bylaws.

Remarks:

a) In this program the student should study the following:

1. 56 credit hrs. in Pure Mathematics (40 Compulsory + 16 Elective).

2. 56 credit hrs. in Computer Science (40 Compulsory + 16 Elective).

3. 16 credit hrs. (courses help the specialization) Elective.

4. 10 credit hrs. (Faculty Requirements) 4 Compulsory + 6 Elective.

5. 6 credit hrs. (University Requirements) Compulsory.

b) The student should summit a research report (2 credit hrs.) by the end of the fourth level.

c) The summer training:

Students are required to undertake 6 training weeks. The student chooses between internal summer training at the faculty or external summer training in appropriate companies or institutions during a summer vacation. The students are expected to seek the relevant training during the summer when the student completed 68 h.

8- Assessment of Program Attendees:

A- Assessment methods:
- Each credit hour equals 100 marks.
- The course grade equals 100 multiply by the number of course credit hour.
- The grade will be as follows:
  - 20%   Midterm exam.
  - 60%   Final exam.
  - 20%   Quizzes, oral exam, practical activities, and semester assignments.

Grading Policy:
The following grading system is applied:

Grades	Symbols	No. of points	Degree
Excellent	A+	4	90% — 100%
	A	3.7	85% — <90%
Very Good	B+	3.3	80% — <85%
	B	3	75% — <80%
Good	C+	2.7	70% — <75%
	C	2.3	65% — <70%
Pass	D	2	60% — <65%
Fail	F	0	<60%

B- Matrix Alignment of Measured ILOs:

Assessments Methods	Measured ILOs			
	A- Knowledge & Understanding	B- Intellectual/ Cognitive Skills	C- Practical and Professional Skills	D- General and Transferable Skills
Midterm Exam (Written exam)	√	√		
Final Exam (Written exam)	√	√		
Quizzes	√	√		
Oral Exam	√			√
Semester Assignments		√	√	√
Practical Activities		√	√	√

9- Program Evaluation Methods:

Evaluator	Tool	Sample
1- Senior student	Questionnaire	20%
2- Alumni	Questionnaire	20%
3- Stakeholders (Staffs)	Questionnaire, workshops, conferences	20%
4- Internal Evaluator(s)	Reports	20%
5 - External Evaluator(s)	Reports	20%

10- Matrices of program

a- Matrix of pure mathematics and computer science program attributes of the graduate student with ARS attributes of the graduate student

ARS Attributes of the graduate student	Program Attributes of the graduate student									
	1	2	3	4	5	6	7	8	9	10
(1.1) Postulate concepts and choose appropriate solutions to solve problems on a scientific basis.	✓									
(1.2) Demonstrate the ability to self-learn, learn lifelong and actively participate in research activities.		✓								
(1.3) Apply different types of reasoning and methods of proof.				✓						
(1.4) Understand how mathematical ideas interconnect and build on one another.			✓		✓					
(1.5) Apply the fundamental theories and principles of computing and information applications.			✓			✓	✓			
(1.6) Design a computing system, component and process to meet the required needs within realistic constraints.							✓	✓		
(1.7) Exploit the techniques, skills and up-to-date computing tools necessary for computing and information practice									✓	
(1.8) Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design, implementation, evaluation and evolution of computer-based systems.			✓		✓		✓			
(1.9) Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data.					✓	✓	✓		✓	
(1.10) Have 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.										✓

b- Matrix of pure mathematics and computer science program ILOs with ARS ILOs

1- Knowledge and Understanding

ARS ILOs	Program ILOs									
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
(2.1.1) Acquire knowledge and understanding of numerical mathematics, and the different ways in which numerical information is used.	✓									
(2.1.2) Acquire knowledge and understanding of mathematical methods and techniques that deal with differential equations and their applications.					✓		✓			
(2.1.3) Acquire knowledge and understanding of the concept of function, and its role in mathematical analysis.	✓									
(2.1.4) Acquire knowledge and understanding of the deductive nature of mathematics, and the roles of definitions, axioms, and theorems to identify and construct valid deductive arguments.	✓							✓		
(2.1.5) Acquire knowledge and understanding of theories and applications of other mathematical trends and/or applied mathematics and/or mathematical statistical and/or computer science.		✓	✓		✓		✓			
(2.1.6) Understand the essential mathematics relevant to computer science.		✓			✓					
(2.1.7) Acquire knowledge and understanding of high-level programming languages.						✓				
(2.1.8) Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.							✓			
(2.1.9) Understand the fundamental topics in computer Science, including hardware and software architecture, software engineering principles and methodologies, operating systems, compilers, parallel and distributed computing, systems and software tools.				✓						
(2.1.10) 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- Intellectual Skills

ARS ILOs	Program ILOs					
	B1	B2	B3	B4	B5	B6
(2.2.1) Formulate mathematical ideas and procedures using appropriate mathematical vocabulary and notation.	✓					
(2.2.2) Construct symbolic forms of problem situations through modeling real-world situations, develop and use the models to make predictions and informed decisions.		✓				
(2.2.3) Develop connections within branches of mathematics and between mathematics and other disciplines.			✓	✓		
(2.2.4) Identify attributes, components, relationships, patterns, main ideas, and errors.					✓	
(2.2.5) Identify a range of solutions and critically evaluate and justify proposed design solutions.						✓
(2.2.6) Solve computer science problems with pressing commercial or industrial constraints.	✓	✓				

3- Professional and Practical Skills

ARS ILOs	Program ILOs						
	C1	C2	C3	C4	C5	C6	C7
(2.3.1) Identify required mathematics and other technical information independently.	✓						
(2.3.2) Use technology to enhance mathematical thinking and understanding.							✓
(2.3.3) Develop and reinforce tenacity and confidence in their abilities to use mathematics.			✓				
(2.3.4) Use appropriate programming languages, web-based systems and tools, design methodologies, and knowledge and database systems.		✓		✓			
(2.3.5) Perform independent information acquisition and management, using scientific literature and Web sources.							✓
(2.3.6) Specify, design, and implement computer-based systems.					✓		
(2.3.7) 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.						✓	

4- General and Transferable skills

ARS ILOs	Program ILOs							
	D1	D2	D3	D4	D5	D6	D7	D8
(2.4.1) Use information and communication technology effectively.	✓							
(2.4.2) Work in groups effectively; manage time, collaborate and communicate with others positively.		✓			✓			
(2.4.3) Apply scientific models, systems, and tools effectively.				✓		✓		
(2.4.4) Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.			✓					
(2.4.5) Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.				✓		✓		
(2.4.6) Reveal communication skills, public speaking and presentation skills, delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.		✓			✓			
(2.4.7) Show the use of general computing facilities.	✓						✓	
(2.4.8) Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.								✓

c- Matrix of pure mathematics and computer science program ILOs and attributes of the graduate student

Program ILOs	Attributes of the graduate student									
	1	2	3	4	5	6	7	8	9	10
A1			✓							
A2			✓							
A3						✓				
A4			✓							
A5				✓			✓			
A6								✓		
A7						✓	✓			
A8				✓						
A9										✓
A10										✓
B1						✓				
B2							✓			
B3									✓	
B4								✓		
B5				✓						
B6								✓		
C1						✓	✓			
C2						✓		✓		
C3					✓	✓				
C4							✓			
C5								✓		
C6								✓		
C7										✓
D1	✓									
D2		✓								
D3	✓									
D4				✓						
D5		✓								
D6					✓					
D7	✓									
D8		✓								

d- Matrix of program structure and program aims

Program structure	Program aims					
	(1)	(2)	(3)	(4)	(5)	(6)
Basic Science	✓	✓		✓		
Humanities (including language)				✓		✓
Specialty (Professional)	✓	✓	✓		✓	
Computer and IT					✓	✓
Research and graduation project		✓		✓	✓	✓
Others (Discretionary)		✓				✓

e- Matrix of program structure and attributes of the graduate student

Program structure	Attributes of the graduate student									
	1	2	3	4	5	6	7	8	9	10
Basic Science	✓	✓	✓							
Humanities (including language)		✓								
Specialty (Professional)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Computer and IT		✓							✓	
Research and graduation project	✓	✓					✓	✓	✓	
Others (Discretionary)		✓								

f- Matrix of course with program ILOs

A: Knowledge and understanding
C: Professional and Practical skills

B: Intellectual skills
D: General and transferable skills

Course Name	Code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6	D7	D8
Introduction to Computer Programing	M139	✓	✓	✓	✓		✓					✓	✓	✓	✓			✓	✓						✓	✓	✓					
Discrete Mathematics 1	M1310	✓		✓	✓	✓						✓	✓	✓				✓	✓	✓					✓	✓		✓				
Structure Programming 1	M1312	✓	✓	✓	✓			✓					✓	✓	✓			✓			✓	✓			✓	✓		✓		✓		
Introduction to Computer System	M2312			✓	✓		✓							✓	✓	✓	✓	✓			✓				✓	✓	✓			✓		
Computer Language	M2311		✓	✓			✓						✓		✓			✓	✓		✓			✓	✓	✓				✓		
Data Structures	M2317			✓		✓							✓			✓		✓						✓	✓	✓	✓		✓			✓
Operating System	M338			✓		✓		✓					✓			✓		✓		✓				✓	✓			✓		✓		
Database System	M3310		✓			✓			✓	✓			✓	✓		✓	✓	✓	✓		✓				✓		✓			✓		
Design and Analyses of Algorithms	M339	✓		✓			✓				✓	✓	✓		✓			✓			✓		✓		✓	✓				✓		
Computer Networks	M437			✓			✓	✓		✓	✓			✓		✓	✓					✓	✓		✓	✓	✓		✓			✓
Computation Theory	M438			✓				✓				✓			✓						✓								✓			
Logic in Computer Science	M4316			✓		✓		✓					✓		✓	✓			✓			✓		✓		✓	✓					
Assembly Language	M2316			✓			✓						✓		✓			✓			✓					✓				✓		
File System	M2318	✓		✓	✓		✓	✓					✓		✓	✓		✓	✓		✓	✓		✓	✓	✓	✓			✓		
Systems Analyses and Design	M3311					✓			✓	✓		✓	✓				✓	✓	✓			✓	✓	✓		✓		✓				✓
Advanced Programming Language	M3312	✓	✓	✓							✓		✓		✓	✓		✓	✓	✓	✓	✓			✓		✓					✓
Programming Language Concepts	M3313		✓		✓		✓		✓			✓	✓		✓		✓	✓		✓	✓		✓			✓		✓				✓
Selected Topics	M3314		✓	✓			✓						✓		✓		✓	✓	✓				✓			✓		✓				✓
Software Engineering	M439			✓	✓	✓			✓	✓		✓		✓		✓					✓	✓	✓		✓				✓		✓	✓
Computer Graphics	M4310			✓	✓		✓						✓	✓		✓		✓	✓		✓					✓	✓	✓				
Advanced Operating System	M4312				✓	✓	✓			✓				✓			✓					✓	✓						✓		✓	✓
Principle of Compiler Design	M4317		✓		✓						✓		✓		✓	✓		✓	✓					✓	✓				✓	✓		
Artificial intelligence	M4315			✓		✓	✓			✓	✓	✓	✓	✓	✓			✓	✓		✓		✓		✓		✓				✓	✓
Computer Vision	M4323			✓	✓	✓							✓	✓	✓				✓		✓		✓			✓	✓					✓
Pattern Recognition	M4325			✓	✓	✓						✓	✓	✓				✓				✓	✓		✓				✓			
Computational Geometry	M4326				✓		✓			✓				✓			✓			✓	✓			✓		✓		✓		✓		
Image Processing	M4322			✓			✓	✓	✓						✓	✓	✓	✓			✓			✓	✓				✓			
Selection in Computers	M4313				✓	✓			✓	✓	✓		✓	✓				✓	✓		✓		✓						✓		✓	
Essay	C000			✓		✓			✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓		✓	✓

Course	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mathematical analysis 1	M111	✓		✓		✓		✓			✓	✓	✓			✓	✓					✓		✓			
Analytical Geometry 1	M112	✓		✓		✓		✓			✓	✓				✓	✓					✓	✓	✓			
Algebra	M113	✓		✓		✓			✓		✓	✓	✓		✓		✓	✓		✓			✓	✓	✓		
Mathematical analysis 2	M114	✓		✓		✓		✓				✓	✓			✓	✓					✓			✓		
Analytical Geometry 2	M115	✓		✓		✓						✓	✓			✓	✓		✓			✓	✓				
Abstract Algebra 1	M116	✓				✓					✓					✓			✓			✓	✓				
Linear Algebra	M117	✓		✓		✓				✓	✓	✓				✓			✓		✓	✓	✓	✓			
Numerical Analysis 1	M118	✓	✓	✓		✓				✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓	✓		✓	
Mathematical Analysis 3	M211	✓		✓				✓		✓	✓	✓				✓	✓		✓		✓	✓	✓	✓			
Ordinary Differential Equation	M212	✓		✓		✓		✓			✓	✓				✓	✓		✓			✓		✓	✓		✓
Introduction to Differential Geometry	M215	✓		✓		✓					✓	✓				✓	✓		✓				✓	✓	✓		
Partial Differential Equation	M216	✓		✓		✓		✓		✓	✓	✓	✓			✓	✓		✓			✓		✓	✓		
Numerical Analysis 2	M217	✓	✓	✓		✓					✓	✓	✓			✓	✓	✓	✓		✓		✓		✓	✓	
Principle of Statistics and Probability 1	M248	✓	✓	✓		✓				✓	✓	✓	✓			✓	✓		✓			✓	✓		✓		
Linear Programing	M2218	✓	✓	✓		✓			✓		✓	✓	✓	✓		✓	✓		✓			✓			✓		✓
General Mechanics	M1213	✓		✓		✓		✓				✓	✓			✓	✓		✓			✓	✓				
Relativity Theory (1)	M2210	✓		✓		✓		✓				✓	✓			✓	✓		✓			✓	✓	✓			
Mathematical Method 1	M2217	✓		✓		✓		✓				✓	✓			✓	✓		✓			✓	✓		✓		
Nonlinear Programing	M2112	✓		✓		✓					✓	✓				✓			✓			✓	✓	✓			
Mathematical Analysis 4	M213	✓		✓		✓		✓		✓	✓	✓				✓	✓		✓			✓		✓			
Abstract Algebra 2	M214	✓						✓		✓		✓				✓			✓		✓	✓	✓	✓			
Real Analysis	M312	✓		✓				✓		✓	✓	✓				✓	✓				✓	✓	✓				
Introduction to analysis and topology	M311	✓				✓			✓		✓	✓	✓			✓	✓					✓		✓			
Theory of Finite Group	M315	✓						✓		✓		✓				✓	✓		✓			✓	✓				
Operation Research	M317	✓		✓				✓		✓	✓					✓			✓			✓		✓	✓	✓	
Differential Equation 3	M3116	✓	✓	✓		✓				✓	✓	✓					✓		✓			✓		✓			
Theory of a Complex Variable	M3114		✓	✓		✓		✓				✓	✓			✓	✓		✓			✓			✓		
Mathematical Logic	M316	✓						✓				✓		✓		✓	✓				✓		✓				✓
Functional Analysis 1	M411	✓		✓					✓		✓	✓	✓			✓	✓					✓	✓			✓	
Functional Analysis 2	M415	✓		✓							✓	✓				✓	✓							✓	✓		
Differential Geometry	M414	✓		✓		✓					✓	✓				✓	✓							✓	✓		
Numerical Analysis (3)	M416	✓		✓		✓		✓				✓		✓		✓	✓	✓					✓	✓		✓	
Essay	M000			✓		✓		✓			✓				✓				✓		✓			✓			✓
Analytical Chemistry (1)	CH134						✓		✓	✓					✓	✓		✓				✓	✓		✓		✓ ✓
Applied Physics	P189						✓		✓	✓					✓	✓		✓				✓	✓	✓		✓	

Course	Code																											
Crystallography	G111					✓		✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
Electromagnetism	P145					✓		✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
Physical Geology	G141					✓		✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
Principles of Inorganic Chemistry	CH122					✓		✓	✓			✓	✓						✓			✓		✓		✓	
Principles of Physical Chemistry	CH111					✓		✓	✓			✓	✓	✓					✓		✓	✓		✓		✓	✓
Properties of Matter	P111					✓		✓	✓			✓	✓						✓			✓		✓			✓
Waves and Acoustics	P144					✓		✓	✓			✓	✓	✓					✓		✓	✓		✓		✓	✓
English (1)	F111							✓	✓			✓	✓						✓			✓		✓		✓	✓
English (2)	F112							✓	✓			✓	✓						✓			✓		✓		✓	✓
Photography and Microfilm	F141							✓	✓			✓	✓						✓			✓		✓		✓	✓
الدراسات البيئية	F151					✓		✓	✓			✓	✓				✓		✓		✓	✓		✓		✓	✓
دراسات إسلامية (1)	F121							✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
مصريات وأثار	F181							✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
تاريخ علم	F110							✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
Computer (1)	U131	✓			✓				✓		✓		✓	✓	✓			✓	✓	✓	✓	✓					
Computer (2)	U132					✓		✓	✓		✓		✓		✓			✓	✓	✓	✓	✓					
Statistics (1)	U133	✓	✓	✓	✓					✓	✓	✓	✓		✓	✓	✓				✓	✓					
قضايا مجتمعية	U190							✓	✓			✓	✓						✓		✓	✓		✓		✓	✓
مدخل إلى الجودة	U000							✓	✓			✓	✓	✓					✓		✓	✓		✓		✓	✓
التدريب الصيفي				✓				✓	✓		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓		✓	✓

g- Matrix of teaching and learning methods with program ILOs

Teaching/Learning Method	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6	D7	D8
Lectures	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																					
Discussion (Brainstorming)												✓													✓	✓	✓				
Practical / Tutorials											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Reading Materials																						✓	✓	✓		✓					✓
Research & Reporting											✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Problem Solving-based Learning											✓		✓		✓		✓		✓	✓							✓				
Self-Learning											✓	✓	✓	✓	✓	✓	✓										✓				
Group Work											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓			
E-learning																								✓		✓		✓	✓		✓

h- Matrix of graduate assessment methods with Program ILOs

Teaching/Learning Method	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7	D1	D2	D3	D4	D5	D6	D7	D8
Mid-term (Written exam)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
Final Exam (Written exam)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
Quizzes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
Oral Exam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																✓					
Semester Assignments											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Practical Activities											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓		

11-   Job Opportunities for graduates

There are many fields and job opportunities for graduates of pure mathematics and computer science, the most important of which is:

- **Demonstrator**
- **Software Developer**
- **Data Analyst**
- **Information Security Specialist**
- **Project Manager**
- **Computer Teacher**
- **Mathematics Teacher**

Program Coordinator: Prof. Mohamed Abu-Shady

Signature:

Head of Department: Prof. Mohamed Abu-Shady   **Date: 29 / 9 / 2024**

Signature:

عميد الكلية	مدير وحدة الجودة	منسق البرنامج
أ.د. حسن علي عليوه	أ.د. حسام عوض	أ.د. محمد محمد ابوشادي