

**Program Specification for Master Degree in Biochemistry Code:
1701700**

University: Alexandria **Faculty:** Medical Research Institute

Program Specification

A- Basic information

1- Program title: Master Degree in Biochemistry

2- Program type: single double multiple

3- Department(s): Biochemistry

4- Coordinator: Dr. Hala Aly Hafez Ahmed

5- External evaluator(s): Dr. Mohamed El-Kersh

6- Last date of program specification approval: 5/6/2014

B- Professional Information

1- Program aims:

- Acquire basic knowledge in all areas of biochemistry in order to realize biochemical and molecular processes.
- Work safely in laboratories and possess basic requirements for practical molecular and biochemical techniques.
- Apply statistical skills; analyze and present the obtained biochemical and molecular data.
- Improve scientific and communications skills.
- Participate in a multidisciplinary teamwork.
- Possess broad ethical principles.
- Criticize, postulate solutions, and deduces the solutions mechanisms and develops judgments in scientific bases.
- Use systemic approaches to design and conduct scientific research.

2- Intended learning outcomes (ILOS)

a- knowledge and understanding:

a1- Review enzymes and coenzymes, hormones, chemistry of blood, fluid, electrolytes and acid-base balance.

- a2- Recall biochemical calculation, carbohydrates, lipid, proteins and nucleic acid metabolism, and metabolic disorders.
- a3- Describe free radicals, antioxidants, implications of free radical in diseases, and laboratory medicine.
- a4- Recall nutrition, malnutrition, vitamins in health and disease, minerals and trace elements, and nanomedicine.
- a5- Explain the general principles of central dogma of molecular biology including DNA replication, mutation, repair, transcription and translation.
- a6- Discuss genetic recombination in prokaryotes and eukaryotes, and the basic principle and application of telomeres, telomerases and reverse transcriptase.
- a7- Describe regulation of gene expression in prokaryotes and eukaryotes.
- a8- Recall the role of oncogenes and tumor suppressor genes in cell cycle control, cell growth and signaling and in carcinogenesis.

b- Intellectual skills:

- b1- Categorize blood constituents according to function.
- b2- Distinguish between different metabolic pathways.
- b3- Distinguish the implication of reactive oxygen species in different diseases.
- b4- Appraise a suitable nanomaterial design for successful biomedical application.
- b5- Analyze the steps of replication, transcription, and translation and mechanisms of DNA repair.
- b6- Compare between genetic recombination in prokaryotes and eukaryotes
- b7- Examine the different mechanisms of transcriptional, posttranscriptional and translational control of gene expression in prokaryotes and eukaryotes.
- b8- Contrast the role of oncogenes and tumor suppressor during the normal cell growth and carcinogenesis process.
- b9- Write a thesis protocol using a scientific systematic approach to a research problem.

c- Professional and practical skills:

- c1- Illustrate laboratory safety and techniques.
- c2- Practice the use of laboratory equipment as pipettes, spectrophotometer and centrifuges.
- c3- Demonstrate animal dissection.
- c4- Interpret biochemical calculations for normality and molarity.
- c5- Apply buffer preparation and protein determination.
- c6- Apply spectrophotometer to determine the protein contents.
- c7- Apply Colorimetric assays to determine lipid profile (Cholesterol, triglycerides, and lipoproteins).

- c8- Apply appropriate tests to determine kidney functions (urea by colorimetric urease enzyme, creatinine by buffer kinetic reaction).
- c9- Apply appropriate tests to determine liver functions (SGPT and SGOT by ALT and AST enzymatic kinetic reaction, bilirubin by colorimetric enzymatic method for direct and total bilirubin and by calculations for indirect bilirubin, ALP by kinetic alkaline phosphatase enzyme) and blood glucose level (Glucose by colorimetric glucose oxidase enzyme).
- c10- Interpret the obtained data to present it in its appropriate format.
- c11- Apply the safety precautions in molecular biology labs (includes handling of samples and chemicals and General Housekeeping).
- c12- Practice techniques to isolate DNA and RNA such as solvent extraction and spin column extraction.
- c13- Apply appropriate method to determine purity and integration of nucleic acid such as spectrophotometric method and agarose electrophoresis.
- c14- Practice the technique of polymerase chain reaction (PCR).
- c15- Perform reverse transcriptase-PCR protocol (RT-PCR).
- c16- Use RT-PCR to assess gene expression level.

d- General and transferable skills:

- d1- Develop the communication skills through group discussion and lectures, and share discussion about other's work.
- d2- Use different sources to extract information and knowledge e.g. books, research articles, thesis, academic websites, etc.
- d3- Assess his learning needs through exams, assignments and discussions.
- d4- Design a time plan for his work during practical sessions and work in group.
- d5- Solve problems on ethical scientific basis will pave the ways to be an effective team leader during practical session and seminars.
- d6- Develop independent learning skills through assignments and seminars.

3- Academic standards

3a- External references for standards (Benchmarks)

Generic Academic Reference Standards of the National Authority for Quality Assurance and Accreditation of Education (NAQAAE)

adopted at MRI council 12/2/2014 and re-adopted at 15/1/2023

Last date of Academic Reference standards (ARS) approval by Institute Council: 15/1/2023

3b- Comparison of provision to selected external references

Generic Academic Standards of NAQAAE	ARS of MSc. of Biochemistry
A1-Basic facts, theories, of the specialty and	a1-Recognize the basic knowledge of

related subjects/ fields.	enzymology, hormones, nutrition and nutrition related diseases, metabolism and metabolic disorders and molecular biology. a2- List the principles and methods related to practical biochemical and molecular biology techniques. a3-Recall the free radicals and its implications in different diseases.
A2-Mutual relation between professional practice and effects on environment.	a4-Memorize the fundamental role of vitamins in health and disease. a5-Explain enzymes in clinical practice. a6-Discuss the laboratory medicine. a7-Recognize the effect of minerals on health and disease. a8- Explain the toxic effects of nanomaterials. a9-Review the basic knowledge of gene expression, its regulation and implications in different diseases. a10-Review the concepts of proto-oncogenes and tumor suppressor genes and their role in cell growth, apoptosis and cell signaling.
A3-Main scientific advances in the field of practice.	a11-Recognize the recent advances in biochemistry and molecular biology fields.
A4-Fundamentals of ethical & legal practice.	a12-State the details of ethical and legal practice and quality standards of the practice.
A5-Quality standards of the practice.	a13- State the details of ethical and legal practice and quality standards of the practice.
A6-Basics and ethics of scientific research.	a14-Recall the basics of research ethics.
B1-Interpret, analyze & evaluate the information to solve problems.	b1- Analyze the basic biochemical information to solve problems through thesis.
B2-Solve some problems that do not conform to classic data (incomplete data).	b2- Appraise the resulting data through thesis.
B3-Integrate different information to solve professional problems.	b3- Differentiate between different biochemical or molecular pathways in different diseases.
B4-Conduct a scientific research &/Or write scientific systematic approach to a research problem (hypothesis).	b4- Write a thesis protocol using a scientific systemic approach to a research problem
B5-Evaluate risks imposed during professional practice.	b5-Examine safety instructions during practical sessions.
B6-Plan for professional improvement.	b6- Analysis of student questionnaire for professional improvement plan

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B7-Take professional decisions in wide range of professional situations.	b7- Criticize the problems faced during the thesis work to take decisions based on scientific concepts.
C1-Competent in all basic and some of the advanced professional skills (to be determined according to the specialty board/ department).	c1-Apply different techniques related to biochemical and molecular biology tests.
C2-Write and appraise reports.	c2- Interpret the obtained data to present it in its appropriate format.
C3-Evaluate methods and tools used in specialty.	c3- Correspond the used methods to the recent and applicable techniques.
D1-Communicate effectively using all methods.	d1- Develop the communication skills through group discussions, lectures and training workshops.
D2-Use information technology to improve his/her professional practice.	d2- Use information technology to improve his professional practice (e.g. statistics programs, bioinformatics, etc.).
D3-Practice self appraisal and determines his learning needs.	d3-Determine students learning needs through student questionnaire.
D4-Share in determination of standards for evaluation of others (e.g.: subordinates/ trainees etc.).	d4- Discuss different topics through assignments and lectures.
D5-Use different sources of information to obtain data.	d5- Use different sources of information to obtained data e.g. books, research articles, thesis, academic websites, etc.
D6-Work in teams.	d6- Work in group through practical session and workshops, and communicate with others positively.
D7-Manage time effectively.	d7-Set a time plan for his work during practical sessions and thesis work.
D8-Work as team leader in situations comparable to his work level.	d7- Think independently to solve problems paves the ways to be an effective team leader during practical sessions and seminars.
D9-Learn independently and seek continuous learning.	d8-Learn independently through assignments, seminars and e-learning use.

4- Curriculum structure and contents

4.a Program duration: 2-4 years

4.b Program structure :

4.b.i- No. of hours per week in each year/semester:

Semester	Core Courses	Elective Courses
	No. of hours	No. of hours
First semester	6	
Second semester	6	4
Third semester	6	
Fourth semester	6	2

4.b.ii- No. of credit hours Lectures Practical Thesis Total

Compulsory Elective Optional

4.b.v- No. of credit hours of specialized courses No. %

4.b.vi- No. of credit hours of other courses No. %

4.b.vii-Field Training No. %

4.b.viii- Program levels (in credit-hours system)

Student is required to pass at least 12 credit hours with CGPA not less than C+ before submitting a thesis proposal.

5- Program Courses

5.1- Compulsory (24 Cr)

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical

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1701701	Biochemistry I	4	3	2
1701702	Biochemistry II	3	3	----
1701703	Biochemistry III	4	3	2
1701704	Biochemistry IV	3	3	----
1701705	Molecular Biology I	2	2	-----
1701706	Molecular Biology II	3	2	2
1701707	Molecular Biology III	2	2	-----
1701708	Molecular Biology IV	3	2	2
Total		24	20	8

5.2- Elective I (N/A)

5.3- Elective II (6Cr)

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1703720	Physiology	2	1	2
1704720	Pharmacology	2	1	2
1705720	Hematology	2	1	2
1717720	Chemical Pathology	2	1	2
1706720	Bacteriology	2	1	2
1707720	Parasitology	2	1	2
1708720	Immunology	2	1	2
1709720	Histochemistry and cell biology	2	1	2
1712720	Medical biophysics	2	1	2
1721720	Medical statistics	2	1	2

5.4- Optional – (none)

6- Program admission requirements

Graduate students with a M.B. Ch. B. of Medicine, B.Sc. of Pharmacy, Science or Veterinary.

7- Teaching and Learning Methods

Lecture

Practical/Clinical

Brainstorming

Discussion Groups

Problem Solving

Self-Directed Learning

Project

Regulations for progression and program completion

For the progression and completion of the program to obtain the degree of Master, the student must:

- 1- Complete 30 credit hours with CGPA of at least C+ through courses.
- 2- Complete 8 credit hours with through thesis.
- 3- Submit a thesis validity report by an examination committee approved by the department council and their members include at least two external examiners.

8- Evaluation of Students enrolled in the program.

Tool evaluation	Intended learning outcomes being assessed
Written	ILOs a &b
Practical	ILOs c
Oral	ILOs a ,b &d
Semester Work	ILOs b & d

Evaluation of the Program

Evaluator	Tool	Sample
1- Senior students	Questionnaire	At least 50 %
2- Alumni	Questionnaire	Representative sample
3- Stakeholders (Employers)	Meeting	Representative sample

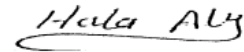
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4- External Evaluator(S) or External Examiner (s)	Report	Dr. Mohamed El-Kersh
5- Other		

Program coordinator:

Name: Dr. Hala Aly Hafez Ahmed

Signature:



Department Head:

Name: Prof. Dr. Maher Abdel- Naby Kamel

Signature:



Date of Department Council Approval: 26-9-2023

Program Aims vs Graduate Attribute matrix

Graduate Attributes of Master Program in Biochemistry

<p>Generic Graduate Attributes of NAQAAE</p>	<p>Graduate Attributes of Master of Science in Biochemistry By the end of this program, the Graduate of Master of Science in Biochemistry should be able to</p>	<p>Program aims</p>
<p>Apply the basics and methodologies of scientific research and use its various tools proficiently.</p>	<p>-Recognize the basic knowledge of enzymology, hormones, nutrition-related diseases, metabolism and metabolic disorders, and molecular biology. - List the principles and methods related to practical biochemical and molecular biology techniques.</p>	<p>Acquire basic knowledge in all areas of biochemistry in order to realize biochemical and molecular processes.</p>
<p>Use the analytical methods in the field of specialty</p>	<p>Perform animal dissection and perform and analyze major biochemical and molecular techniques.</p>	<p>Work safely in laboratories and possess basic requirements for practical molecular and biochemical techniques.</p>
<p>Apply specialized knowledge in the field of specialty and integrate it with relevant knowledge in his professional</p>	<p>-Explain and review the fundamental key role of vitamins, minerals, enzymes, hormones, and nanomaterials in health and</p>	<p>Apply statistical skills; analyze and present the obtained biochemical and molecular data.</p>

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practice.	<p>disease with the applications of these fundamentals in practical practice.</p> <p>-Explain and review the basic knowledge of gene expression, its regulation with cell cycle checkpoints, and implications in different diseases along with the gene expression analysis techniques.</p>	
Demonstrate awareness of current problems and modern visions in the field of specialty	-Analyze the basic biochemical information to solve problems through the thesis.	Use systemic approaches to design and conduct scientific research.
Identify professional problems in the field of specialty and propose solutions to them.	-Differentiate between different biochemical or molecular pathways in different diseases.	Criticize, postulate solutions, deduce the solution's mechanisms, and develop judgments on a scientific basis.
Master appropriate professional skills in the field including the use of technology.	-Recognize the recent advances in biochemistry and molecular biology fields.	Improve scientific and communication skills.
Communicate efficiently and lead work teams.	-Work in groups through practical sessions and workshops and communicate with others positively.	Participate in multidisciplinary teamwork.
Take Decisions in different professional contexts.	-Criticize the problems faced during the thesis work to make decisions based on scientific	Criticize, postulate solutions, deduce the solution's mechanisms,

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	concepts.	and develop judgments on a scientific basis.
Employ the available resources to achieve the highest benefit and maintain them.	-Use different sources of information to obtain data e.g. books, research articles, theses and academic websites	Possess broad ethical principles.
Show awareness of his/her role in community development and environmental preservation in light of global and regional changes.	-Develop communication skills through group discussions, lectures and training. -Use information technology to improve his professional practice (e.g. statistics programs, bioinformatics, etc.).	Participate in multidisciplinary teamwork.
Act in a manner that reflects a commitment to integrity, credibility, professionalism, and accountability.	-Conduct scientific research &/Or write a scientific systematic approach to a research problem (hypothesis) and then compare between obtained data and recent scientific publications through thesis.	-Possess broad ethical principles. -Use systemic approaches to design and conduct scientific research
Realize the need for self-development and engaging in continuous learning.	-Learn independently through assignments, seminars and e-learning use.	Criticize, postulate solutions, deduce the solution's mechanisms, and develop judgments on a scientific basis.

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Courses vs Program ILOs matrix

ILOS Courses	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7	B8	B9	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	D1	D2	D3	D4	D5	D6		
Biochemistry I 1701701	x								x									x	x	x	x	x											x	x	x	x	x	x	x		
Biochemistry II 1701702		x								x																							x	x							
Biochemistry III 1701703			x								x															x	x	x					x	x	x	x	x	x	x	x	
Biochemistry IV 1701704				x								x																					x	x	x	x	x	x	x	x	
Molecular Biology I 1701705					x								x																				x	x	x	x	x	x	x	x	
Molecular Biology II 1701706						x								x																				x	x	x	x	x	x	x	
Molecular Biology III 1701707							x								x																			x	x	x	x	x	x	x	
Molecular Biology IV 1701708								x																											x	x	x	x	x	x	x

