



21 September University for Medical & Applied Sciences
Faculty of Laboratory Medicine

Program Specifications

Master Degree

of

Clinical Biochemistry and Molecular Biology

Code :03-01

2021-2022

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1) Basic Information of the program:	
Program Title	Master of Clinical Biochemistry and Molecular Biology.
Awarding Institution	University of 21 September for Applied & Medical Sciences
Division/institute responsible for the program	Biochemistry and Molecular Biology department/ Faculty of Laboratory Medicine
Program type	Single
Language of study	English
Year of study in the program	2022
Mode of delivery	Regular, minimum attendance 75%
Teaching institution	Faculty of Laboratory Medicine
System of study	Semester system
Duration of study	The program is at least two years full time program that includes advanced theoretical for two semesters and Research work for at least a year. The total number of credit hours to obtain a MSc degree is 38 credit hours, including courses and thesis.
Final award/s available	Master Degree in Clinical Biochemistry and Molecular Biology.
Award title	Master of Clinical Biochemistry and Molecular Biology
Qualification for admission to the program	The Bachelor's degree in: Diagnostic and Laboratory medicine.
Grade for admission to the program	As per the admission rules made by Ministry of Higher education and scientific research-Yemen Republic
Other requirements	Satisfactory outcome of an interview evaluating background.
Data of program specification (New program)	2022
Prepared by	Associated Prof. Dr. Ebtesam Al-Zabedei Assistant. Prof. Dr. Nawal Al-Henhena
Program coordinator:	Assistant. Prof. Dr. Nawal Al-Henhena



2) Program Overview:

The program provides students a broad background in Clinical Biochemistry and Molecular Biology and techniques used in advanced researches in the field. It is offered for laboratory medicine students who hold the bachelor degree in Laboratory Medicine or Diagnostic Medicine. The graduate students from this program should be completed 38 credits hours

3-University Vision, Mission, and Goals:

University vision 2025:

A contemporary university with national responsibility and a faith identity

University mission:

Leading the transformation in the management and delivery of health care with all partners by setting a standard of excellence in education and medical and applied research in a way that meets the needs of Yemeni society, its privacy and regional influence.

University objective:

- 1- Ensuring the application of quality standards and setting standards of excellence in medical and applied sciences, scientific research and community service.
2. The centrality of the student in the educational process, the partnership with them for life, the consolidation of the principles of national responsibility and faith identity, their care and the development of their capabilities after graduation and during work.
3. Attracting, employing and retaining scholars, cadres and highly specialized talents to gain minds and reverse the trend of “brain drain” in a way that enhances and ensures the creation of thinkers, businessmen and good citizens.
4. Continuous development of the distinguished academic infrastructure and the establishment of modern research and service centers with high efficiency and capable of making a real impact locally and regionally.



5. Enhancing the university's position as a preferred partner for local, regional and international partnership through implementing innovative models of education, exchanging research and knowledge and providing real and effective outcomes for developing professional practices to benefit from them locally and regionally

B. Mission, Goals, and Learning Outcomes of the master program

Mission:

To provide highly qualified graduate skilled in the Clinical Biochemistry and Molecular Biology through advanced practical training and conducting scientific research.

the program aim is to

- 1- Produce health science professionals and in-depth Biochemistry and Molecular Biology knowledge of different metabolic, cellular, and genetic disorders
- 2- Provide our candidate with the ability to apply different and recent molecular biological and genetic techniques
- 3- Improve the research skills and productivity relevant to clinical biochemistry and practice
4. Enhance self-development and collaborative practice
5. Promote leadership and teamwork to deliver high-quality health care services
- 6- Provide opportunities to gain research capacity and publish scientific relevant studies



Graduate Attributes of the program
<i>Upon successful completion of the program in master of Clinical Biochemistry and Molecular Biology, the graduates will reflect</i>
1. Deep discipline advanced knowledge in the fields of Biochemistry and Molecular Biology.
2. Independence of critical and analytical thinking, both within their field of study, and beyond for the use of their knowledge for service to others.
3. Ability to identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work.
4. Leadership and competency in the laboratory, including application of the scientific method and appropriate use of basic and state of the art laboratory tools and techniques.
5. Professional written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike.



III. Intended Learning Outcomes from the program:

A. Knowledge and understanding:

At the end of the course the student should be able to

1	Understand the basic Specific knowledge in medical Biochemistry and molecular biology, including molecular genetics and immunology, cellular, and DNA technology coupled with hands on skills and leadership skills for a successful career.
2	Describe the important mechanisms of cellular, molecular genetics and immunology disorders, eliminated, clarify treatment and outcomes of diseases with emphasis on cellular and molecular genetics.
3	List the key considerations and principles in the planning and design of a study on the basis of statistical methods.
4	Identify different metabolic, molecular causes of diseases and deep comprehensive of using different laboratory techniques for proper diagnosis

B. Intellectual Skills:

At the end of the course the student should be able to

1	Interpret and explain results of <i>Clinical Biochemistry and Molecular Biology</i> and effectively to clinicians
2	Illustrate important clinical biochemistry and molecular genetic disease.
3	Design guidelines for the prevention, diagnosis and treatment of genetic disorders
4	Classification of genetic disorders



C. Professional and Practical Skills:

At the end of the course the student should be able to

1	Demonstrate diagnostic laboratory tests in clinical biochemistry, molecular genetics, molecular and cellular immunology to offer basic advice on relevant investigations
2	Perform diagnostic laboratory tests in clinical biochemistry and genetic molecular
3	Critically evaluate data and design experiments to test hypotheses relevant to the practice of clinical Biochemistry and Molecular Biology.
4	Perform quality control and assurance procedures

D. General and Transferable outcomes:

At the end of the course the student should be able to

1	Communicate effectively through oral presentations, computer processing and presentations, and written reports.
2	Respect the role of staff and co-staff members regardless of degree or occupation.
3	Write scientific article according to the basics of scientific research



Program Standards & Benchmarks
Academic Standards:
-NARS (national academic references standard) for medical education in Yemen
-Academic Standards Curriculum Criteria of Accreditation Board
-Unified Regulations for Student Affairs, Ministry of Higher Education and Scientific Research
Benchmarks
1- Jordan University of Science and Technology https://www.just.edu.jo/FacultiesandDepartments/FacultyofAppliedMedScs/Depts/MedLabSciences/Pages/Welcome.aspx
2- Galgotias University https://www.galgotiasuniversity.edu.in/basic-applied-sciences-biological-science-faculty.asp
3-Central University of Rajasthan http://www.curaj.ac.in/academic-program http://www.curaj.ac.in/sites/default/files/Syllabus%20Integrated%20M.Sc.%20Biochemistry%20%28From%202019%20academic%20session%29_1.pdf
4-Sana'a University

System of Study	
I-Duration of program	2 – 4 years maximum 4 years divided into courses and thesis
II-.Structure of the program:	Total contact number of credit hours 38
-First year	Program-related essential courses and Students ILOs
Thesis	MSc thesis subject should be officially registered after pass the theoretical part and got in minimum 75%. Discussion and acceptance of the thesis could be set at least after 12 months from MSc registering date.



Courses of the program

	Courses name	Credit hours
1	Analytical Biochemistry I	2
2	Advanced Biochemistry I	2
3	Comparative Biochemistry	2
4	Cellular and Molecular Biology	2
5	Advance Immunology	2
6	Biomedical Statistics & Research Methodology	2
7	Analytical Biochemistry II	2
8	Advanced Biochemistry II	2
9	Advanced Clinical Biochemistry	2
10	Cellular and Molecular immunity	2
11	Advanced Molecular Genetics	2
12	Biotechnology and Bioinformatics	2
13	Advanced Epidemiology	1
14	Thesis	6
Elective course MS Program		31
I	Special Courses	****
II	Special Topics in Pharmaceutical Biochemistry	2
III	Special Topics in Neurobiochemistry	2
Total		4
Total all of courses		35



The study plan for Master of Biochemistry and Molecular Biology:

	Course code	Course Title / Description	CRIDET HOUR
Year Semester First Year/ First Semester		Analytical Biochemistry I	2
		Advanced Biochemistry I	2
		Comparative Biochemistry	2
		Cellular and Molecular Biology	2
		Advance Immunology	2
		Advanced Epidemiology	1
	TOTAL		
First Year/ Second Semester		Analytical Biochemistry II	2
		Advanced Biochemistry II	2
		Advanced Clinical Biochemistry	2
		Cellular and Molecular immunity	2
		Advanced Molecular Genetics	2
		Biotechnology and Bioinformatics	2
		Biomedical Statistics & Research Methodology	2
		Thesis	6
		Elective course MS Program	20
		Special Courses	***
		Special Topics in Pharmaceutical Biochemistry	2
	Special Topics in Neurobiochemistry	2	
TOTAL			4
Total all of courses			35



Annex – Survey of Credit Hours of programs

Benchmarking			Jordan University of Science and Technology	Galgotias University	Central University of Rajasthan	Faculty of Medicine Sana'a University	-
Program Requirement	Credit Hours	----	25	46	66	-----	16
-----	Percentage	----	-----	-----	-----	-----	57.1
Program Elective	Credit Hours	4	9	13	6	-----	5
-----	Percentage	----	-----	-----	-----	-----	17.9
Program Thesis	Credit Hours	6	-----	-----	-----	-----	7
-----	Percentage	----	-----	-----	-----	-----	25
Total Credit Hours	Credit Hours	27	9	18	15	-----	28
-----	Total	37	43	77	87	-----	28

Teaching Strategy

Teaching Strategy	Description of how it will be used
Lectures	It is the most frequently employed teaching method to convey knowledge and explain theories to students in large groups or in sessions, which consist of more than one group gathered in one classroom.
Seminars	These are mainly used with small groups of students in which they find better chances for discussing and negotiating the different concerns of their studies.
Lab experiments	Students doing practices in medical labs individually or in small groups.
Training	This is a practical kind of course where the students are required to plan and execute some field visits to hospitals, corporations or institutions where the process of clinical pharmacy is essential.



Discussion	This is done by allowing the students to ask questions during the lecture and respond to them by the lecturer or other students for the purpose of establishing and clarify the subject of the lecture strongly and increase the concentration and absorption of the student and the attention and not to enter the boredom.
Presentations	Helps the students to be more confident with themselves and make them to show the others what knowledge they have acquired. It can be followed in many types of courses and tasks.
Self-learning	Self-learning is the process by which learners teach themselves using any materials or resources to achieve clear goals without the direct help of the teacher
Case study	Case studies are defined as the scientific documentation of a single clinical observation which is so important study design in advancing medical scientific knowledge especially of rare disease.
Office Hours	Office hours are hours determined by the faculty member (professor of the course) to which the student studies. The hours allocated by the professor to meet with his students to help them and answer their queries in the event of any questions they may not be enough time for the lecture to answer it.

Assessment Strategies	
Written examinations	Final Term exam is conducted at the end of each course.
Oral exams	For selected courses
Technical or practical reports /Presentations	As indicated in the course specification
Assignments including problem-solving exercises	The entire assignments including problem-solving exercises of coursework activities during the teaching period of each course (which includes group and individual work, tests and presentations, etc.)
Individual and group project work	As indicated in the course specification
Quizzes	For all courses except for project
Home work	For all courses except for project



Project Assessment:	
Each project will be assessed by a committee of three members as follows:	
Item	Marks Distribution
Project supervisor	60%
Internal examiner: a member of the department staff.	20%
External examiner: a qualified external examiner (either from other departments of the faculty or from another university)	20%
Total	100%

Characters of program graduates:

1. Committed to Islamic traditions.
2. Have the knowledge and skills needed to provide health care services with reliable laboratory findings.
3. Demonstrate professionalism through honesty, integrity and confidentiality of patient results.
4. Demonstrate respect for the dignity and privacy of patients.
5. Communicate effectively and inspire confidence with patients, colleagues, physicians, and other health care team members.
6. Possess basic knowledge in conducting scientific research.
7. Contribute to the general wellbeing of community and respect the religious culture and social constants of society.



Annex-1 Program Structure

No.	Requirements	No. of	Credit	Rational Weight %	
		Courses	Hours		
1	Program Requirements	Compulsory	13	27	73
		Elective	2	4	10
2	Thesis	1	6	15	
	Total:	17	37		





Annex-2, Academic Standards Curriculum Criteria of Accreditation board.

Academic Standards:	
1	NARS for medical education in Yemen
2	Annex- 2, Academic Standards Curriculum Criteria of Accreditation Board
3	Annex- 3, Unified Regulations for Student Affairs, Ministry of Higher Education and Scientific Research





Annex-3, Alignment Program vision, mission and Objectives with University and Faculty

	University	Postgraduate studies and scientific research	Faculty of laboratory Medicine Vision, Mission and Goals:	Medical clinical biochemistry and molecular biology
Vission	A contemporary university with national responsibility and a faith identity	Scientific research and contemporary postgraduate studies according to quality standards that meet the needs of the labor market locally and regionally	Contemporary and competitive faculty in Laboratory medicine.	
Mission	Leading the transformation in the management and delivery of health care with all partners by setting a standard of excellence in education and medical and applied research in a way that meets the needs of Yemeni society, its privacy and regional influence.	to prepare and implement scientific programs Qualitative application in order to prepare distinguished research leaders that contribute to the treatment of Community problems.	Contribute to improving health services in laboratory medicine by achieving standards of excellence in education and scientific research in a way that meets the needs and privacy of society and contributes to addressing global health problems.	To prepare highly qualified graduate skilled in the clinical biochemistry and molecular biology through advanced practical and conducting scientific research.



<p>Objectives</p>	<p>1- Ensuring the application of quality standards and setting standards of excellence in medical and applied sciences, scientific research and community service. 2. The centrality of the student in the educational process, the partnership with them for life, the consolidation of the principles of national responsibility and faith identity, their care and the development of their capabilities after graduation and during work. 3. Attracting, employing and retaining scholars, cadres and highly specialized talents to gain minds and reverse the trend of “brain drain” in a way that enhances and ensures the creation of thinkers, businessmen and good citizens. 4. Continuous development of the distinguished academic infrastructure and the establishment of modern research and service centers with high efficiency and capable of making a real impact locally and regionally. 5. Enhancing the university's position as a preferred partner for local, regional and international partnership through implementing innovative models of education, exchanging research and knowledge and providing real and effective outcomes for developing professional practices to benefit from them locally and regionally</p>	<p>1-Establishing quality postgraduate programs that attract local and regional university graduates 2- Continuous development and updating of postgraduate programs in accordance with comprehensive quality standards 3- Preparing distinguished researchers through continuing education programs and developing research skills. 4- Partnership with similar scientific institutions in scientific research. 5- Developing the infrastructure, human and financial for graduate studies programs and scientific research in accordance with the standards of academic accreditation. 6- Automating the system of postgraduate studies and scientific research and activating electronic links. 7- Attracting expertise from faculty members and researchers from the internal and external environment.</p>	<p>1. Preparing a highly qualified and skilled cadre in the field of laboratory medicine. 2. Building an educational system that keeps pace with development and conforms to academic quality standards. 3. Adopting, supporting and investing scientific research programs to meet the requirements of sustainable development and to contribute to solving global health problems. 4. Developing a culture of community partnership in the field of laboratory medicine and research. 5. Enhancing the facility position as a preferred partner for local, regional and international partnership through implementing innovative models of education, exchanging research and knowledge and providing real and effective outcomes for developing professional practices to benefit from them locally and regionally</p>	<p>1- Produce health science professionals and in-depth Biochemistry and Molecular Biology knowledge of different metabolic, cellular, and genetic disorders 2- Provide our candidate with the ability to apply different and recent molecular biological and genetic techniques 3- Improve the research skills and productivity relevant to clinical biochemistry and practice 4. Enhance self-development and collaborative practice 5. Promote leadership and teamwork to deliver high-quality health care services 6- Provide opportunities to gain research capacity and publish scientific relevant studies</p>
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Annex-4, Survey of Credit Hours of Similar Programs

Benchmarking		University of 21 September	Sana'a university	Jordan University of Science and Technology (JUST)	Galgotias University	Central University of Rajasthan
Program Requirements	Credit Hours	27	16	25	46	66
	Percentage	73	57	58	60	76
Program Electives	Credit Hours	4	5	9	13	6
	Percentage	10	18	21	17	7
Program Thesis	Credit Hours	6	7	9	18	15
	Percentage	15	25	21	23	17
Total Credit Hours		37	28	43	77	87



Annex-6, Alignment Program Intended Learning Outcomes (PILOs) to Faculty Educational Objectives (FObj).

1. Program PILOs	Goals Objectives				
	FObj1	FObj2	FObj3	FObj4	FObj5
A1	√	√	√	√	√
A2	√	√	√	√	√
A3	√	√	√	√	√
A4	√	√	√	√	√
B1	√	√	...	√	√
B2	√	√	...		
B3	√	√	...		
B4	√	√	√		
C1	√	√	√	...	
C2	√	√	√	...	
C3	√	√	√		√
C4	√	√	√	√	
D1	√	√	√		√
D2	√	√	√		√
D3	√	√	√		√



Annex-8, Alignment of Program Intended Learning Outcomes (PILOS) to Program Objectives (POs)

1. Program PILOs	Program Objectives					
	PObj1	PObj2	PObj3	PObj4	PObj5	PObj6
A1	√	√	√	
A2	√	√	...	√	√	
A3	√	√	√	√	√	√
A4	√	√	√	√	√	√
B1	√	√	...	√	√	√
B2	√	√	...	√		√
B3	√	√	...	√		√
B4	...	√	√	√	√	√
C1	√	√	√	√
C2	√	√
C3	√	√	√
C4	√	√	...	√		
D1	√	√	√	√	√	√
D2	√	√	...	√	√	√
D3	√	√	√	√	√	√



Annex- 5, Survey on Mission and Objectives of the Program and Similar Accredited Programs

University	21 September	Sana'a university	Jordan University	Galgotias University	Central University of Rajasthan
Faculty	Laboratory Medicine	Faculty of medicine	Applied Medical Sciences	Faculty of Science	School of Life Sciences
Department	Biochemistry	Medical Biochemistry	Medical Laboratory Sciences	Bio-Sciences	Biochemistry
Program	Master Degree in Clinical Biochemistry and Molecular Biology	M.Sc. Biochemistry & Molecular Biology	Master Degree in Medical Laboratory Sciences/Clinical Microbiology, Immunology and Serology		
Country	Yemen	Yemen	Jordan	India	India
Program Mission	To provide highly qualified graduate skilled in the Clinical Biochemistry and Molecular Biology through advanced practical and conducting scientific research.	to pursuit of excellence in research, postgraduate teaching and advanced training.	To be a premier educational and research-intensive department that improves human health through leadership and collaborative approach to discovery and innovation in research, education, and patient care.	Establish state-of-the art facilities for world class education and research, Collaborate with industry and society to align the curriculum, Involve in societal outreach program to identify concerns and provide sustainable ethical solutions and Encourage life-long learning and team- based problem solving through an enabling environment	to contribute to and work with a sense of commitment towards the educational, cultural, economic, environmental, health and social advancement of the region and the nation at large by providing excellent undergraduate liberal education and quality



					programs leading to bachelors, masters, professional and doctorate degrees.
Program Objectives (PObj)	<p>1- Produce health science professionals and in-depth Biochemistry and Molecular Biology knowledge of different metabolic, cellular, and genetic disorders</p> <p>2- Provide our candidate with the ability to apply different and recent molecular biological and genetic techniques</p> <p>3- Improve the research skills and productivity relevant to clinical biochemistry and practice</p> <p>4. Enhance self-development and collaborative practice</p> <p>5. Promote leadership and teamwork to deliver high-quality health care services</p> <p>6- Provide opportunities to gain research capacity and publish scientific relevant studies</p>	<p>1. Develop laboratory skills in the field of biochemistry and to some extent molecular biology through training and demonstrations.</p> <p>2. Develop the knowledge in the role of biochemistry and the advent of genetic engineering in the understanding of medical disorders.</p>	<p>1. Research: provide a dynamic and motivating environment for performing quality and multidisciplinary research in medical and health sciences for both the faculty and students.</p> <p>2. Education and advancement: become leaders in the movement towards reforming and promoting education and career development of medical laboratory sciences.</p> <p>3. Health care delivery: graduate top health care providers and deliver quality community medical laboratory services.</p> <p>4. Collaboration and outreach: transform the future of medical laboratory sciences,</p>	<p>PO1 Apply knowledge of basic and applied sciences to the solution of complex biochemical conditions.</p> <p>PO2 Perform experiments and researches, perform analysis and interpret data for complex biochemical conditions.</p> <p>PO3 Identify, investigate, analyse and generate solutions for biochemical processes.</p> <p>PO4 Use research-based knowledge together with design of experiments, analysis and interpretation of data, to provide valid conclusions with an understanding of their limitations.</p> <p>PO5 Create, select and apply appropriate techniques, resources and modern science and research tools within a defined specification that meet specified needs with appropriate consideration for</p>	<p>GoalsTo facilitate accessible and affordable quality education that equips the students with scholarly and professional skills, moral principles, and global perspectives;To strengthen both faculty and student research addressing basic and regional problems;To integrate national and international perspectives into our fundamental four-fold mission of teaching, research, extension and consultancy;To explore knowledge and wisdom in order to build a wealth of interdisciplinary academic resources indispensable for sustainable</p>



			<p>clinical research, and education by fostering novel collaborative alignments among basic and clinical scientists, clinicians, and educators throughout the University, as well as with local and international public and private partners.</p> <p>5. Integrity and accountability: create a culture of the highest ethical standards, honesty, and transparency.</p> <p>6. Diversity and inclusion: create a diverse and inclusive culture that integrate students, knowledge, and ideas from different backgrounds.</p>	<p>public health and safety.</p> <p>PO6 Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal issues and the consequent responsibilities relevant to the professional biologist.</p> <p>PO7 Understand the impact of professional life sciences solutions in communal and environmental contexts and demonstrate knowledge and need for sustainable development.</p> <p>PO8 Execute responsibility professionally and ethically.</p> <p>PO9 Function effectively as an individual, and as a member or leader in diverse resource teams.</p> <p>PO10 Articulate ideas, comprehend and write effective reports, documentation and to communicate effectively with the basic and applied sciences community and with society at large.</p> <p>PO11 Demonstrate knowledge and</p>	<p>development to accomplish the status of a leading research-intensive university; and to engage in transferring knowledge and technology to the community in order to strengthen and elevate the community potential, and to increase the competitiveness of India at the global level;To employ the strategy of proactive management of the university administration and to operate the system within a sensible framework of high-quality governance based on efficiency, transparency and accountability;To formulate the University as one of the best places in the world to attain intellectual skills and acquire an affirmative</p>
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				<p>understanding of science and technical principles to manage projects in multidisciplinary research areas.</p> <p>PO12 Seeking stimulation and to exploring numerous opportunities to engage in independent and life-long learning in the broadest context of technological change.</p>	<p>mindset to thrive in an increasingly internationalized and competitive job market</p> <p>simultaneously acting as responsible citizens of the global community by the inculcation of value-oriented education.</p>
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Annex-12 , Matrix of Mapping Program PILO's with Courses

No	Course	ILOS														
		Knowledge & understanding skills				Intellectual skills				Practical & professional skills				General & Transferable skills		
		A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3
1	Analytical Biochemistry I	X		X	X											
2	Advanced Biochemistry I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	Comparative Biochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	Cellular and Molecular Biology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	Histopathology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Advance Immunology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	Research Methodology			X				X		X		X				
8	Biomedical Statistics			X				X				X				
9	Analytical Biochemistry II	X		X						X						
10	Advanced Biochemistry II	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	Advanced Clinical Biochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X



13	Advanced Molecular Genetics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
14	Biotechnology	X		X												
15	Advanced Physiology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
I	Immunohistochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
II	Special Topics in Cancer biology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
III	Special Topics in Pharmaceutical Biochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Special Topics in Neurobiochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Special Topics in Molecular Medicine	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X



Curriculum Map:

N o.	Course	ILOS																					
		Knowledge & understanding skills				Intellectual skills						Practical & professional skills					General & Transferable skills						
		A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	D1	D2	D3	D4	D5	D6	D7
1	Analytical Biochemistry I	X		X	X						X										X	X	X
2	Advanced Biochemistry I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	Comparative Biochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	Cellular and Molecular Biology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	Histopathology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Advance Immunology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	Research Methodology			X				X		X	X	X		X		X					X	X	X
8	Biomedical Statistics			X				X		X	X				X						X	X	X
9	Analytical Biochemistry II	X		X							X	X									X	X	X
10	Advanced Biochemistry II	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	Advanced Clinical Biochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	Advanced Molecular Genetics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
14	Biotechnology	X		X																	X	X	X
15	Advanced Physiology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
I	Immunohistochemistry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
II	Special Topics in Cancer biology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
III	Special Topics in Pharmaceutical	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X



Annex-14 , Survey of Course Names per Academic Semesters of Similar Programs

	21-Sep			Sana'a university	Jordan University of Science and Technology (JUST)			Galgotias University			Central University of Rajasthan			
	Course		Course Hours	Course	Course Hours		Course	Course Hours	Course		Course Hours	Course	Course Hours	
	L	P	T Ch		L	P	T Ch	L	P	T Ch	L	P	T Ch	
Level I														
1	Analytical Biochemistry I	2	0	2										
2	Advanced Biochemistry I	2	0	2				Advanced Biochemistry	3	3	Advanced Biochemistry	4		4
3	Comparative Biochemistry	2	0	2							Biomolecules and Hormones Enzymology	3 +	1 +	4 +
4	Cellular and Molecular Biology	3	0	3							Molecular Biology-I			4
5	Histopathology	3	0	3										
6	Advance Immunology	2	0	2							Immunology			2
7	Research Methodology	2	0	2							Research methodology	3		3
8	Biomedical Statistics	2	0	2										
Level 2														
9	Analytical Biochemistry II	2	0	2										
10	Advanced Biochemistry II	2	0	2										
11	Advanced Clinical Biochemistry	2	0	2										
12	Cellular and Molecular immunity	3	0	3										
13	Advanced Molecular Genetics	0	0	3				Advanced Molecular Biology	2					

