MISR UNIVERSITY for science and technology



للعملوم والتكنول

كلية التكنولوجيا الحيوية College of Biotechnology

Programe Specification

Bachelor's Degree in Biotechnology

Bylaw 2018

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College of Biotechnology

Program Specification

Bachelor's Degree in Biotechnology

Bylaw 2018

2019-2020

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- 1. Program Title: Biotechnology
- 2. Program Type: Single

3. Departments:

- a. Department of Medical Biotechnology.
- b. Department of Pharmaceutical and Industrial Biotechnology.
- c. Department of Agricultural Biotechnology.
- d. Department of Environmental Biotechnology.
- e. Department of Bioinformatics and Genomics.
- Coordinator: Prof. Dr. Hala Fawzy Eissa, Vice Dean for Education and Students Affairs, College of Biotechnology, Misr University for Science and Technology.
- Internal Evaluator: Prof. Dr. Mokhtar El-Zawahry, Dean, College of Biotechnology, Misr University for Science and Technology.
- External Evaluator: Prof. Dr. Abdel Rahim Saad Shoulah, Faculty of Medicine, Benha University, Egypt.
- 7. Last Approval Date of program specifications from College Council: College council No. 56, 14/9/2019

1. Program Aims

By the end of the program, the graduate should be able to:

- 1. Study the information and application in various disciplines of biotechnological science to improve the quality of life.
- 2. Integrate biotechnological knowledge and skills into practices, designing and execution of guided projects.
- 3. Employ comprehensive research, laboratory procedures, quality control and create new valuable products
- 4. Consider the ethical, social and legal issues related to applications of biotechnology and demonstrate awareness of biohazard and safety regulations and procedures related to applications of biotechnology.
- 5. Recognize the accumulated knowledge in the field of biotechnology and gain experience in basic administrative skills, information processing and data management for quality planning.
- 6. Acquire critical thinking, innovation, creativity and problem-solving skills to be enrolled successfully in the postgraduate studies.
- 7. Value the continuous learning and the ability to manage intellectual curiosity throughout life.
- 8. Achieve highest standards of professional performance as biotechnologist.

2. Intended Learning Outcomes of the Program (ILOs)

2A. Knowledge and understanding:

The Biotechnology graduates will be able to demonstrate knowledge and understanding in the following:

- 2.A1. Recognize interdisciplinary basic sciences biotechnology (Chemistry, Biophysics, Biology, Mathematics, Scientific Thinking, etc.).
- 2.A2. Identify the biological concepts from molecular to cellular levels.
- 2.A3. Describe biochemical, genetic and molecular mechanisms and functions in different organisms.
- 2.A4. List the biotechnological activities and procedures.
- 2.A5. Identify the biotechnological in-puts.
- 2.A6. Recognize the biotechnological out-puts and out-comes.
- 2.A7. Recognize the applications of biotechnology in cancer biology, molecular diagnosis, forensic medicine.
- 2.A8. List the applications of biotechnology pharmaceutical and industry fields.
- 2.A9. Re-call the applications of biotechnology in environment field.
- 2.A10. Identify the applications of biotechnology in agriculture.
- 2.A11. Demonstrate the health and safety practices in laboratories and samples handling.
- 2.A12. Identify the risks and biohazard of biotechnological applications and processing.
- 2.A.13.List the general information in biotechnology through Selflearning and practice of lifelong learning.
- 2A.14. Accumulate basic digital information and bioinformatics.

- 2.A.15.Differentiate between moral, ethical and legal biotechnology issues.
- 2.A.16.Evaluate the regulatory policies in biotechnology research.
- 2A.17. Know the sustainable needs and impacts of biotechnological solutions on environment and societal context.
- 2A.18. Define the problem-solving approaches in different biotechnology fields.
- 2A.19. Select the concepts of creation in multi-disciplinary situational analysis.in biotechnology.
- 2A.20. Identify the computational skills, basics of programming and digital learning strategies necessary for analyzing data
- 2A.21. Explain universal and the cultural diversity issues in accordance to biotechnology.
- 2A.22. Define the basis of economics and management in commercial biotechnology applications.

2B. Intellectual skills

The biotechnology graduate must be able to:

- 2.B1. Determine the effects of biotechnological applications on healthcare.
- 2.B2. Justify the effects of biotechnological applications on environment conservation.
- 2.B3. Grade the effects of biotechnological applications on food security.
- 2.B4. Interpret data from different biotechnological disciplines.
- 2.B5. Re-call creative solutions needed in the different biotechnological fields.
- 2.B6. Appraise biotechnological products referenced to standards.

- 2.B7. Extrapolate biotechnological products in laboratories of animal and plant tissue culture, molecular diagnosis of human and animal diseases, molecular diagnosis of plant diseases, molecular forensic medicine, referenced to standards.
- 2.B8. Involve the scientific methods to formulate the research questions in biotechnology disciplines and design a scientific experiment.
- 2.B9. Formulate goals and objectives for utilizing biotechnological information and data.
- 2.B10. Analyze and evaluate evidence-based information and data in field of biotechnology.
- 2.B11. Administrate the industrial applications of biotechnology, and business practices.

2C. Practical and professional skills

The graduate of biotechnology should acquire the following practical skills and be able to:

- 2.C.1. Apply practical procedures in basic sciences (Chemistry, Biochemistry, Biophysics, Biology Genetics, etc.).
- 2.C.2. Perform biotechnology procedures in medical biotechnology within the scope of animal and human health care.
- 2.C.3. Apply biotechnology procedures in pharmaceutical and industrial products.
- 2.C.4. Manipulate biotechnology procedures in agriculture and food security.
- 2.C.5. Perform biotechnology procedures in environment preservation.
- 2.C.6. Apply standard operating procedures in biotechnology laboratories.

- 2.C.7. Manipulate different biotechnological techniques in molecular diagnosis of human and animal diseases, molecular diagnosis of plant diseases, molecular forensic medicine, etc....
- 2.C.8. Acquire the practical skills of biotechnology equipment maintenance.
- 2.C.9. Operate animal tissue culture and plant tissue culture procedures in complete aseptic conditions.
- 2.C.10. Apply appropriate tools and techniques in biotechnological manipulation
- 2.C.11. Operate molecular genetic workflow.
- 2.C.12. Practice genetic engineering procedures and techniques according to standards.
- 2.C.13. Monitor, collect and record scientific biotechnological data effectively.
- 2.C.14. Categorize and archive effectively the scientific biotechnological data.
- 2.C.15. Utilize information technology, bioinformatics tools and library resources to collect, interpret and asses the relevant data from literatures.

2.D. General and transferable skills:

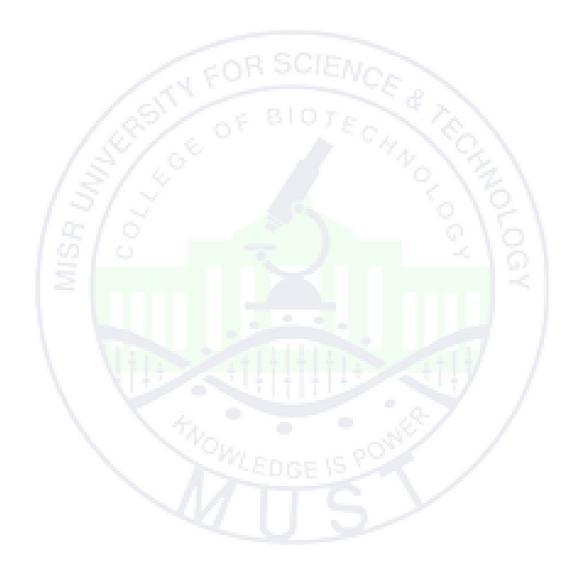
The biotechnology graduate must be able to:

- 2.D1. Apply communication skills in interprofessional and social context
- 2.D2. Work productively and cooperatively within a team.
- 2.D3. Be able to set priorities
- 2.D4. Use available resources and manage time effectively

- 2.D5. Appraise continues learning and develop self-education and selfevaluation skills
- 2.D6. Acquire creative thinking and problem-solving techniques in an ethical and scientific manner.
- 2.D7. Respect society, human and animal rights in biotechnological applications.
- 2.D8. Conduct priorities for professional responsibility towards communities
- 2.D9. Use relevant information technologies efficiently
- 2.D10. Utilize relevant data-basis in different biotechnological activities
- 2.D11. Prepare, present, and discuss information and data professionally.



Academic Reference Standards (ARS, Annex I) is approved by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE). Approval date: 3/7/2016, session No. 156.



IV. Curriculum Structure and Contents

The students are required to complete successfully a minimum of (144) credit hours for graduation.

Program duration: 4 years (8 semesters)

Program levels: Four levels (144 Credit hours)

No. of credit hours:

Total

University requirements:	15 Credit Hours
College requirements:	129 Credit Hours (105 Compulsory + 24 Elective)

144 Credit Hours

Number of credit hours per semester as bylaw 2018

Level	Semester	Credit Hours*			
		Lecture	Practical	Total	
101	First Semester	14	5	19	
1001	Second Semester	14	6	20	
	First Semester	12	6	18	
2	Second Semester	12	6	18	
3	First Semester	12	6	18	
3	Second Semester	12	6	18	
	First Semester	- 11	6	17	
4	Second Semester	10	6	16	
	Total	97	47	144	

		Progr		
No.	Subject Areas	Cr. Hrs	Percentage *	ARS
1	Basic Sciences	25	17.4	18.7%
2	Core Biotechnology Sciences	61	42.4	42.5%
3	Capstone and Projects	8	5.6	5.6%
4	Discretionary Courses	24	16.6	15%
5	Humanities and Social Studies	15	10.0	11.3%
6	Information Technology	81978	7.6	6.9%
	Total	144	100%	100%

The courses are classified as bylaw 2018 as the following:

* Differences between accredited ARS and Programe Percentage are not significant (0.0% - 1.6%). Core courses percent is the same.

1. Basic Sciences

These courses comprise 25 credit hours at a percentage of 17.4% of the total graduation hours (Table 2).

Course Code Course Title		Cr. Hrs
BCHM 201	Biochemistry	3
BIOL 101	General Biology I	3
BIOL 102	General Biology II	3
BPHY 201	Biophysics	3
CHEM 101	General Chemistry	3
MATH 101	Basics in Mathematics	2
MICR 102	General Microbiology	3
OCHM 102	Organic Chemistry	3
STAT 102	Biostatistics	2
	Total	25

 Table 2.
 Basic sciences of the College of Biotechnology programme curriculum.

2. Core Biotechnology Sciences

These courses comprise 61 credit hours at a percentage of 42.4% of the total graduation hours (Table 3).

Course Code	Course Title	Credit Hours		
ANTC 202	Animal Tissue Culture	3		
BIOT 101	Introduction to Biotechnology	2		
CMBT 402	Commercial Biotechnology	2		
CMBL 302	Cancer Molecular Biology	3		
CYGN 202	Cytogenetics	3		
ENBT 401	Environmental Biotechnology	3		
EXBC 202	Experimental Biochemistry	3		
GENE 102	Principals of Genetics	3		
GENG 301	Genetic Engineering I	3		
GENG 302	Genetic Engineering II	3		
HMBL 201	Human Biology (Structure and Function of Human Body)	0 ³ 0		
HPTH 202	Human Pathology	3		
MCGN 201	Microbial Genetics	3		
MLBS 401	Molecular Biology of Biotic and Abiotic Stresses	3		
MLDG 401	Molecular Diagnosis of Human Diseases	3		
MLFM 402	Molecular Forensic Medicine	3		
MLGN 201	Molecular Genetics I	3		
MLGN 202	Molecular Genetics II			
PLTC 201	Plant Tissue Culture 3			
PRBT 301	Process in Biotechnology	3		
PRPH 301	Principles of Pharmacology	3		
	Total	61		

 Table 3.
 Core Biotechnology Sciences of the College of Biotechnology programme curriculum.

3. Capstone and Projects

These courses comprise 8 credit hours at a percentage of 5.6% of the total graduation hours (Table 4). In these courses the students are being taught and acquired skills to prepare research proposal, plan of study, experimental design, action plan, perform the research experiments, how

to write and analyze the data in a scientific report and/or a paper to be published, and presentation skills.

Course Code Course Title		Cr. Hrs
BTSM 402	Biotechnology Seminar	2
RSBT 401	Research in Biotechnology I	3
RSBT 402	Research in Biotechnology II	3
	Total Dulehia	8

Table 4.Contents of Capstone and Projects of the College of Biotechnology
programme curriculum.

4. Discretionary Courses

These courses comprise 24 credit hours at a percentage of 16.6% of the total graduation hours. These courses cover the multidisciplinary sciences of Medical, Pharmaceutical, Agricultural and Environmental Biotechnology. The student is required to complete successfully a minimum of 24 credit hours from the following courses (Table 5).

 Table 5.
 Contents of Discretionary Courses of the College of Biotechnology programme curriculum.

Course Code	Course Title	Credit Hours
ANBR 301E	Animal Breeding	3
ANBT 401E	Animal Biotechnology	3
APMC 402E	Applied Microbiology	3
APTH 302E	Animal Pathology	3
ARAB 101E	Arabic Language	3
BFBP 403E	Biofertilizers and Biopesticides	3
BGMD 303E	Biochemical Genetics of Metabolic Diseases	3
BHGN 304E	Behavioral Genetics	2
BIOT 201E	Concepts and Issues in Biotechnology	2
BMBF 305E	Biomass and Biofuel	3
BRBD 404E	Bioremediation and Biodegradation	3
CBIL 202E	Comparative Biology	2

CBPH 203E	Cell Biology and Physiology	3			
CHPE 306E	Chemistry of Proteins and Enzymes	3			
COPR 204E	Computer Programming I	3			
COPR 205E	Computer Programming II	3			
ENMC 206E	Environmental Mutagens and Carcinogens	3			
EVPG 207E	Evolution and Population Genetics	2			
GETH 405E	Gene Therapy	3			
GNEM 208E	General Embryology	3			
GNHT 209E	General Histology	3			
HUMN 101E	Behavioral Psychology	3			
HUPH 210E	Human Physiology	3			
IMMN 307E	Immunology	3			
INVF 308E	In-vitro Fertilization and Embryo Transfer	3			
MABT 406E	Marine Biotechnology	3			
MCBT 407E	Microbial Biotechnology	3			
MDBT 408 E	Medical Biotechnology	- 2 0			
MGGR 409E	Management of Genetic Resources and Gene Bank	2			
MLEP 309E	Molecular Epidemiology	3			
NABT 310E	Nanobiotechnology	3			
PBRD 211E	Plant Breeding	3			
PHBT 410E	Pharmaceutical Biotechnology	3			
PHCG 311E	Pharmacognosy	3			
PHGN 411E	Pharmacogenomics	3			
PHYS 101E	General Physics	3			
PLBT 412E	Plant Biotechnology	3			
PPTH 212E	PTH 212E Plant Pathology				
SCBT 312 E	Stem Cell Technology	3			
	Total				

5. Humanities and Social Studies

These courses comprise 15 credit hours at a percentage of 10.0% of the total graduation hours (Table 6).

Table 6.Contents of Humanities and Social Sciences of the College of
Biotechnology programme curriculum.

Course Code Course Title		Cr. Hrs
BEBS 302	Bioethics and Biosafety	3
ENGL 101	English Language I	3
ENGL 102	English Language II	3
ENGL 201	English Language III	3
HUM 102	Scientific Thinking	3
10	TotalBIOT	15

6. Information Technology

These courses comprise 11 credit hours at a percentage of 7.6% of the total graduation hours (Table 7).

 Table 7.
 Contents of Information Technology of the College of Biotechnology programme curriculum.

Course Code Course Title		Cr. Hrs
BINF 301	Principles of Bioinformatics	3
COMP 101	Introduction to Computer Applications	3
GANL 302	Genomic Analysis	3
PANL 401	Proteomic Analysis	2
1	Total 💿	11

V. Distribution of Courses in an Ideal Plan of Enrollment

First Level

First Semester

Course Code	Course Title	Credit Hours*			Prerequisite
		Lecture	Practical	Total	•
BIOT 101	Introduction to Biotechnology	2	-	2	-
MATH 101	Basics in Mathematics	2	-	2	-
BIOL 101	General Biology I	S 2	ENI-	3	-
CHEM 101	General Chemistry	2	14	3	-
BPHYS 101	Biophysics	8 2 7	EL	3	<u> </u>
ENGL 101	English Language I	2	14	3	\odot \checkmark
COMP 101	Introduction to Computer Applications	2	1	3	121
	Total	14	5	19	

Second Semester

Abbreviations		C	-		
& Course No.	Course Title	Lecture	Practical	Total	Prerequisite
BIOL 102	General Biology II	2	1	3	BIOL 101
GENE 102	Principals of Genetics	2	•1	3	BIOL 101
MICR 102	General Microbiology	2	15 40	3	BIOL 101
OCHM 102	Organic Chemistry	2	1	3	CHEM 101
STAT 102	Biostatistics	2	5	2	MATH 101
ENGL 102	English Language II	2	1	3	ENGL 101
HUMN 102	Scientific Thinking	2	1	3	-
	Total	14	6	20	

Second Level

First Semester

Course Code	Course Title	Credit Hours*			Prerequisite
		Lecture	Practical	Total	-
MLGN 201	Molecular Genetics I	2	1	3	OCHM 102 - GENE 102
MCGN 201	Microbial Genetics	2	1	3	MICR 102- GENE 102
BCHM 201	Biochemistry	2	1	3	OCHM 102
PLTC 201	Plant Tissue Culture	2	ENCR	3	BIOL 101
HMBL 201	Human Biology (Structure and Function of Human Body)	B 20	Eby	3	BIOL 102
ENGL 201	English Language III	2	1	3	ENGL 102
	Total	12	6	18	

Second Semester

Abbreviations	Course Title	Credit Hours*			Prerequisite
& Course No.		Lecture	Practical	Total	
MLGN 202	Molecular Genetics II	2	1	3	BCHM 201 - MLGN 201
HPTH 202	Human Pathology	2	1	3	HMBL 201
CYGN 202	Cytogenetics	2	1	3	GENE 102
EXBC 202	Experimental Biochemistry		1	3	BCHM 201
ANTC 202	Animal Tissue Culture	2	1	3	BIOL 102
Elective Course		2	1	3	
	Total	12	6	18	

First Semester

Course Code	Course Title	Credit Hou			Prerequisite
Course Coue	course The	Lecture	Practical	Total	Trerequisite
GENG 301	Genetic Engineering I	2	1	3	MLGN 202
PRBT 301	Process in Biotechnology	2	1	3	MCGN 201 - MLGN 201
BINF 301	Principals of Bioinformatics	R 250	IEN	3	STAT 102 - MLGN 202
PRPH 301	Principles of Pharmacology	2	1	3	BCHM 201 - HPTH 202
Elective Course	8/00	2	Eic,	3	5
Elective Course	10	2	1	3	12
Г	otal	12	6	18	

Second Semester

Course Code	Course Title	Credit Hours*			Prerequisite
Course Coue	Course ritte	Lecture	Practical	Total	Trerequisite
GENG 302	Genetic Engineering II	2	1	3	PLTC 201 - ANTC 202 - GENG 301
GANL 302	Genomic Analysis	2	1	3	BINF 301
CMBL 302	Cancer Molecular Biology		15 19	3	HMBL 201 - MLGN 202
BEBS 302	Bioethics and Biosafety	2	1	3	MLGN 202
Elective Course		2	2	3	
Elective Course		2	1	3	
	Total	12	6	18	

Fourth Level

First

Course Code	Course Title	Credit Hours*			Prerequisite
		Lecture	Practical	Total	
PANL 401	Proteomic Analysis	2	-	2	GANL 302
MLBS 401	Molecular Biology of Biotic and Abiotic Stresses	2	1	3	GENG 302
MLDG 401	Molecular Diagnosis of Human Diseases	S ² CI	EN	3	MLGN 202 - HPTH 202
ENBT 401	Environmental Biotechnology	2	10	3	PRBT 301 - GENG 302
RSBT 401	Research in Biotechnology I	1	2	3	GENG 302
Elective Course	10	2	1	3	15
	Total	11	6	17	

Second

Course Code	Course title	Credit Hours*			Prerequisite
		Lecture	Practical	Total	
BTSM 402	Biotechnology Seminar	2		2	GENG 302
CMBT 402	Commercial Biotechnology	2		2	GENG 302
MLFM 402	Molecular Forensic Medicine	2	1	3	HMBL 201 - MLGN 202
RSBT 402	Research in Biotechnology II	EDGE	3	3	RSBT 401
Elective Course	N	2	1	3	
Elective Course		2	1	3	
	Total	10	6	16	

Elective Courses for First and Second Levels

Course Code	Course Title	Credit Hours*			Prerequisite
		Lecture	Practical	Total	
ARAB 101E	Arabic Language	2	1	3	-
BIOT 201E	Concepts and Issues in Biotechnology	2	-	2	BIOT 101
CBIL 202E	Comparative Biology	2	-	2	BIOL 102
СВРН 203Е	Cell Biology and Physiology	S ²	EN	3	BIOL 101 – BIOL 102
COPR 204E	Computer Programming I	2	-16	3	COMP 101
COPR 205E	Computer Programming II	2	Ery	3	COPR 204E
ENMC 206E	Environmental Mutagens and Carcinogens	2	1	3	GENE 102
EVPG 207E	Evolution and Population Genetics	2	-	2	GENE 102
GNEM 208E	General Embryology	2	1	3	HMBL 201
GNHT 209E	General Histology	2	1	3	BIOL 102
HUMN 101E	Behavioral Psychology	2	1	3	
HUPH 210E	Human Physiology	2	1	3	BIOL 102
PBRD 211E	Plant Breeding	2	1	3	GENE 102
PHYS 101E	General Physics	2	10	3	-
PPTH 212E	Plant Pathology	2	1	3	BIOL 101 – MICR 102

Course Code	Course Title	Credit Hours*			Prerequisite
		Lecture	Practical	Total	
ANBR 301E	Animal Breeding	2	1	3	GENE 102
APTH 302 E	Animal Pathology	2	1	3	BIOL 102
BGMD 303E	Biochemical Genetics of Metabolic Diseases	2	1	3	GENE 102 – BCHM 201
BHGN 304E	Behavioral Genetics	2	ENCL	2	GENE 102 – HMBL 201
BMBF 305E	Biomass and Biofuel		Tel	3	MLGN 202
CHPE 306E	Chemistry of Proteins and Enzymes	2	1	3	BCHM 201
IMMN 307E	Immunology	2	1	3	BCHM 201
INVF 308E	In vitro Fertilization and Embryo Transfer	2	1	3	HMBL 201
MLEP 309E	Molecular Epidemiology	2	1	3	MLGN 202
NABT 310E	Nanobiotechnology	2	1	3	EXBC 202 - GENG 301
PHCG 311E	Pharmacognosy	2	1	3	PRPH 301
SCBT 312 E	Stem Cell Technology	2	1	3	ANTC 202 – MLGN 202

Elective Courses for Third Level

Course Code	Course Title	Cı	edit Hours [:]	Prerequisite	
		Lecture	Practical	Total	
ANBT 401E	Animal Biotechnology	2	1	3	GENG 302
APMC 402E	Applied Microbiology	2	1	3	GENG 302
BFBP 403E	Biofertilizers and Biopesticides	2	1	3	GENG 302
BRBD 404E	Bioremediation and Biodegradation	2	1	3	GENG 302
GETH 405E	Gene Therapy	2	IEN/C	3	GENG 302
MABT 406E	Marine Biotechnology	2	1	3	GENG 302
MCBT 407E	Microbial Biotechnology	2	(°C,	3	GENG 302
MDBT 408E	Medical Biotechnology	2	1	3	GENE 302
MGGR 409E	Management of Genetic Resources and Gene Bank	2	-	2	GENG 301
PHBT 410E	Pharmaceutical Biotechnology	2	1	3	PRPH 301 – GENG 302
PHGN 411E	Pharmacogenomics	2	1	3	PRPH 301 – – GENG 302
PLBT 412E	Plant Biotechnology	2	1	3	GENG 302

Elective Courses for Fourth Level

VI. Courses specifications

Courses specifications are attached in separate file (Annex VI).



1. Program Admission Requirements

All applicants, irrespective of the type of secondary school certificate they hold should have:

- Completed a minimum of 12 years of regular schooling prior to admission to the university.
- Passed all subjects qualifying for admission into the various colleges as set forth by the Supreme Council of Egyptian Universities.
- The minimum acceptable score for admission into the various colleges is announced at the beginning of each academic year.
- All applicants should submit original certificates, diplomas, transcripts and documents.
- Holders of certificates or diplomas from other countries should have their certificates and diplomas authenticated by the educational authorities issuing them and the Egyptian embassies in these countries.
- Holders of American High School Diploma and secondary school certificates from Russia and East European countries have their diplomas and certificate authenticated by the Egyptian cultural attaché in each country.

2. Regulations for the program and program completion

To be awarded the bachelor's degree, students must complete the required credit hours in courses which the grades are **D** or better and must earn a cumulative grade point average of **2.0** or better. These requirements must be completed within the period specified for each college.

For the College of Biotechnology: A minimum of <u>144</u> credit hours are to be completed within a maximum of 6 years. Students will register for <u>12</u> credits as minimum and <u>20</u> credits as maximum per week. A student may be allowed to register for 24 credits at the last graduation semester.

2.1. Drop-and-Add Courses

During the first two weeks at the beginning of each semester, students are allowed to change their registration by adding and dropping courses after counseling their academic advisors on the web site – provided they do not exceed the maximum credits allowed. Check the university calendar for the drop-and-add schedule.

2.2. Course withdrawal

Students may withdraw a particular course (or courses) if they find (through quizzes and mid-term exam) that they will be unable to complete the course successfully. In such case, the student must file a <u>"Withdrawal Form"</u> after consulting the academic advisor and the course instructor. Courses withdrawn before deadline for course withdrawal will have a "W" in the grade report. These courses are not counted toward graduation and their credits are not used to compute the GPA.

Courses withdrawn after the deadline of course withdrawal automatically receive a failing grade "F" and their credit points are used to compute the GPA. No refund will be given for courses withdrawn.

2.4. Incomplete

If a student faces unanticipated circumstances that would prevent him/her from completing the requirements of a course – such as sudden illness – during the final, he/she may ask for an Incomplete (I) in this course. A petition has to be submitted to the college dean stating reasons for requesting "incomplete" and enlacing supporting evidence. Students who have done unsatisfactory work in quizzes and mid-term examination (less than 60%) are not eligible for incomplete.

If after careful scrutiny the petition is accepted, "a request for an incomplete" has to be filled specifying the requirements the student has to fulfill to complete the final exam and the date suggested for meeting such requirement. After successful completion of the requirements, the instructor would fill in a Change of Grade form. If the requirements are not completed in due date or before the end of the following semester, an "incomplete" will automatically be changed to an "F".

Students who have an "incomplete" in any course during a semester will lose the fee reduction scholarships in the following semester.

2.5. Repeating Courses

If a student fails in a required course, he has to repeat the same course, but if he fails in an elective course, he may repeat the course or take another elective course instead after consulting his academic advisor and the approval of the college dean. Students are allowed to repeat courses they have already taken with a passing grade <u>of "D" or better for improving the grade and/or raising the CGPA.</u>

2.6. Class attendance regulations

Students should attend all classes for which they are registered to obtain a maximum educational benefits. Absence or lateness does not excuse

students from required course work. Students whose absence record exceeds 25% of course hours are not allowed to sit for the final exam and receive a failing grade "F" in that course.

2.7. Teaching Methods

Teaching Strategy	Program ILO's		
-Interactive lecture			
-Cooperative learning			
-Brainstorming	Knowledge and understanding		
-Self-learning	CENCE		
-Interactive digital E-Learning	107 PA		
-Cooperative learning	1501 60		
-Brainstorming	Intelligetual ability		
-Self-learning	Intellectual skills		
-Interactive digital E-Learning	N ≥ 1		
-Experimental learning			
-Project-based learning	Practical and professional skills		
-Experimental learning			
-Cooperative learning			
-Project-based learning	General and transferable skills		
-Self-learning			

2.8. Assessment Tools

Assessment Methods

Different assessment methods are used for the students of the Biotechnology Program as seen in the next Table.

Method	Definition	Intended Learning Outcomes ' ILO's'	Suitable for
Objective	These include	To assess	-Formative
written	multiple-choice, true-	Knowledge and	assessment,
examinations	false, matching, and	understanding, and	Summative
	short-answer	intellectual skills	midterm and final
	assessment items.		examinations
Quizzes	Quizzes and practice	To assess	Formative
	tests are short	Knowledge and	assessment

	versions of written	understanding, and	
	examinations and are	intellectual skills	
	designed to help and		
	prepare students for a		
	Summative		
	assessment		
Class activity	To assess General	To assess General	Formative
	and transferable skills	and transferable	assessment
		skills	
	*The assessor	To assess	
	observes a student	knowledge and	
	performing a skill.	understanding,	
Practical exam		intellectual skills,	
	COR:	Practical &	· · · · · · · · · · · · · · · · · · ·
		professional skills,	
	all o	& General &	2
1.1	22/ 28 0	transferable skills	102
Research paper	Assess general skills,	General and	Summative final
and	IT, team working,	transferable skills	examinations
presentations	attitude, team leading		1. 1. 2. 1
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Marks Distribution

	Intended Learning Outcomes (ILOS)	Weight	
Assessment Method		2 Credit hours courses	3 Credit hours courses
Continues Evaluation (2 quizzes + Assignments/activities)	Knowledge and Understanding - intellectual skills - General and transferable skills	20%	20%
Mid-Term Exam	Knowledge and Understanding - intellectual skills	20%	20%
Practical Final Exam	Practical and professional skills	N V	20%
Final Written Exam	Knowledge and Understanding - intellectual skills	60%	40%

2.9. Grading System

Grade	Written Grade	Points	Percentage
A*	Excellent	4.0	95 - 100
А	Excellent	4.0	90 - <95
A-	Excellent	3.6	85 - <90
B+	Very Good	3.3	80 - <85
В	Very Good	3.0	75 - <80
B-	Very Good	2.7	72 - <75
C+	Good	2.3	70 - <72
С	Good	2.0	65 - <70
C-	Pass	1.7	63 - <65
D+	Pass	1.3	62 - <63
D	Pass	1.0	60 - <62
F	Fail	Zero	<60

Semester grades are reported by letter only. The scale of grades and grade points are as follows:

Graduating Grades

Grade	CGPA	Percentage
Excellent	3.6-4	85 - 100
Very Good	2.7 - <3.6	72 - <85
Good	2 - <2.7	65 - <72

- A, B, C: are passing grades

- C-. D+, D: are conditional pass grad

2.10. Grade Point Average GPA and CGPA

Grade Point Average (GPA) is computed each semester to show the students academic standing. It is computed by multiplying each course credits by the grade points corresponding to the grade received, then adding all points earned and dividing the total number of credits in the semester. As the student progresses in his study, his transcript will show a grade point average for each semester as well as a cumulative grade point average CGPA of all courses taken in different semesters. Students should earn a successful grade in each course studied.

On graduation, a general CGPA is calculated by adding the grade points for all courses studied and dividing the grand total by the total number of credits required for graduation.

3. Evaluation Methods of the Program

The different evaluation methods of the Biotechnology Program are illustrated in the following table.

Evaluator	Tools	Sample
Senior students*	Questionnaire and brain storming	40% of the students
Graduates	Questionnaire	~ 20% of graduates
External evaluator	Reports	1 0 0
Employment agencies (Stakeholders)	Questionnaire – Board of Faculty	Medical, Pharmaceutical, Agricultural and Environmental Institutions and Corporations – Ministry of Interior (Criminology Departments) - IVF Centers – Stem Cell Technology Centers, Etc.

*Senior Students: students in the last (fourth) year of collegue

Program Coordinator

Eiss

Prof. Dr. Hala F. Eissa Professor of Molecular Genetics, Vice Dean for Education and Students Affairs

Date: 14/9/2019

Dean

Prof. Dr. Mokhtar M. El-Zawahry, M.D., Ph.D. Professor of Molecular Medicine, Vice President for Education and Students Affairs

Academic Reference Standards (ARS)

for

Biotechnology Program

College of Biotechnology Misr University for Science and Technology (MUST)

> July 2016 1st Edition

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National Authority for Quality Assurance and Accreditation of Education

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National Authority for Quality Assurance and Accreditation of Education

Introduction

Biotechnology is the application of living organisms or bioprocesses to create new products, although the uses of genetic engineering and other scientific techniques have revolutionized the area. Biotechnology is a multidisciplinary field where integration of knowledge and skills from various disciplines including Genetics, Genomics, Proteomics, Molecular Biology, Microbiology, Biochemistry, Biophysics, Bioinformatics and Nanotechnology are the skeletal basis of biotechnology. The utilizations and applications of knowledge and skills in biotechnology will have great impact on progress in various domains including medicine, health care, pharmacy, agriculture, engineering, environment, and national security.

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National Authority for Quality Assurance and Accreditation of Education

Academic Reference Standards (ARS) for Biotechnology

The Attributes of Biotechnology Graduates

The graduates of Biotechnology program should be able to:

- Recognize the comprehensive understanding of biotechnological sciences and their applications in various disciplines of biotechnology to improve quality of life.
- 2. Comprehend the accumulated information in the field of biotechnology.
- Demonstrate competency in integration of biotechnological knowledge and skills into practices, and participate in designing and execution of guided projects.
- Practice extensive biotechnological activities related to research, laboratories techniques, quality control, development and generation of new valuable products.
- 5. Demonstrate awareness of biohazard and safety regulations and procedures related to applications of biotechnology.
- 6. Recognize consideration of ethical, social and legal issues related to applications of biotechnology.
- 7. Acquire competency in basic administrative capabilities, handling information and data management for quality planning.
- 8. Possess critical thinking, innovation, creativity and problem solving capabilities.

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- 9. Appreciate the continuous learning and the capacity to maintain intellectual curiosity throughout life.
- 10. Be engagement successfully in the postgraduate studies.
- 11. Exhibit highest standards of professional endeavor as Biotechnologist.

1. Knowledge and Understanding

The graduates of Biotechnology program should be able to demonstrate the knowledge and understanding of:

- 1.1. Biotechnological and related sciences.
- 1.2. Basis of biotechnological activities, procedures, in-puts, out-puts and outcomes.
- 1.3. Value of biotechnological applications on quality of life and recognize the involved risks and biohazards.
- 1.4. Self-learning and practice the concept of lifelong learning to deal with accumulated amount of information in biotechnology.
- 1.5. Ethical, legal, and social issues associated with biotechnology.
- 1.6. Innovation, creation and problem-solving approaches in multi-disciplinary situational analysis.
- 1.7. Strategies of digital learning and basic of programming.
- 1.8. Global and cultural diversity issues in accordance to biotechnology.
- 1.9. Basis of economics and administration of biotechnology applications.

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2. Intellectual Skills

- The graduates of Biotechnology program should be able to:
- 2.1. Assess and evaluate the impact of biotechnological applications on quality of life.
- 2.2. Interpret data from different biotechnological disciplines and synthesis creative solutions.
- 2.3. Evaluate biotechnological products, in field and/or laboratories, referenced to standards.
- 2.4. Formulate hypotheses, and design scientific experiment.
- 2.5. Formulate goals and objectives, utilizing biotechnological information and data, for quality planning.
- 2.6. Apply management and business techniques and practices appropriate to engineering industry.

3. Practical and Professional Skills

- The graduates of Biotechnology program should be able to:
- 3.1. Employ the theoretical knowledge and skills into practices in different biotechnological domains.
- 3.2. Apply various biotechnological techniques, operate and maintain equipment.
- 3.3. Perform tissue culture procedures in sterilized environment.
- 3.4. Carry out molecular biology and genetic engineering procedures and techniques according to standards.
- 3.5. Monitor, collect, record, categorize, catalogue, and archive scientific biotechnological data effectively.

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3.6. Retrieve, analyze and evaluate relevant data from literature, using information technology, bioinformatics and library resources.

4. General and Transferable Skills

- The graduates of Biotechnology program should be able to:
- 4.1. Communicate effectively using variety of media.
- 4.2. Collaborate effectively within team and set priorities.
- 4.3. Demonstrate effective time and resources management.
- 4.4. Demonstrate lifelong learning, self-learning and selfevaluation.
- 4.5. Adopt a creative attitude in an ethical and scientific approach.
- 4.6. Recognize professional responsibility towards communities.
- 4.7. Use software and digital data-basis effectively.
- 4.8. Present and discuss information fluently.

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Subject Areas	Percentage
Basic Sciences	18.7
Core Biotechnology Sciences	42.5
Capstone and Projects	5.6
Discretionary Courses	15
Humanities and Social Studies	11.3
Information Technology	6.9
Total	100 %

Curriculum Structure

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Glossary

1. Institution

A University, Faculty or higher institute providing education programs leading to a first university degree or a higher degree (Master or Doctorate).

2. Attributes of the Graduates

Competencies expected from the graduates based on the acquired knowledge and skills gained upon completion of a particular program.

3. National Academic Reference Standards (NARS)

Reference points designed by NAQAAE to outline/describe the expected minimum knowledge and skills necessary to fulfill the requirements of a program of study.

4. Academic Standards

Reference points defined by an institution comprising the collective knowledge and skills to be gained by the graduates of a particular program. The academic standards should surpass the NARS, and be approved by NAQAAE.

5. Subject Benchmark Statements

Guideline statements that detail what can be expected of a graduates in terms of the learning outcomes to satisfy the

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standards set for the program. They enable the outcomes to be compared, reviewed and evaluated against agreed upon standards.

6. The Program

A set of educational courses and activities designed by the institution to determine the systematic learning progress. The program also imparts the intended competencies required for the award of an academic degree.

7. Intended Learning Outcomes (ILOs)

Subject-specific knowledge, understanding and skills intended by the institution to be gained by the learners completing a particular educational activity.. The ILOs emphasize what is expected that learners will be able to do as a result of a learning activity.

8. Knowledge and Understanding

Knowledge is the intended information to be gained from an educational activity including facts, terms, theories and basic concepts. Understanding involves comprehending and grasping the meaning or the underlying explanation of scientific objects.

9. Intellectual Skills

Learning and cognitive capabilities that involve critical thinking and creativity. These include application, analysis, synthesis and evaluation of information.

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10. Professional and Practical Skills

Application of specialized knowledge, training and proficiency in a subject or field to attain successful career development and personal advancement.

11. General and Transferable Skills

Skills that are not subject-specific and commonly needed in education, employment, life-long learning and self development.. These skills include communication, team work, numeracy, independent learning, interpersonal relationship, and problem solving... etc.

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Annex II

Matrix between Biotechnology Program Aims and ARS Graduate Attributes

Matrix between Biotechnology Program Aims and ARS Graduate Attributes

Program Aims	ARS Graduate Attributes
1. Study the information and application in various disciplines of biotechnological science to improve the quality of life.	1. Recognize the comprehensive understanding of biotechnological sciences and their applications in various disciplines of biotechnology to improve quality of life.
2. Integrate biotechnological knowledge and skills into practices, designing and execution of guided projects.	3 Demonstrate competency in integration of biotechnological knowledge and skills into practices and participate in designing and execution of guided projects.
3. Employ comprehensive research, laboratory procedures, quality control and create new valuable products.	4. Practice extensive biotechnological activities related to research, laboratories techniques, quality control, development and generation of new valuable products.
4. Consider the ethical, social and legal issues related to applications of biotechnology and demonstrate awareness of biohazard and safety regulations and procedures related to applications of biotechnology.	 Demonstrate awareness of biohazard and safety regulations and procedures related to applications of biotechnology. Recognize consideration of ethical, social and legal issues related to applications of biotechnology.
5. Recognize the accumulated knowledge in the field of biotechnology and gain experience in basic administrative skills, information processing and data management for quality planning.	 Comprehend the accumulated information in the field of biotechnology. Acquire competency in basic administrative capabilities, handling information and data management for quality planning.
6. Acquire critical thinking, innovation, creativity and problem-solving skills to be enrolled successfully in the postgraduate studies.	 8. Possess critical thinking, innovation, creativity and problem-solving capabilities. 10. Be engagement successfully in the postgraduate studies.

7. Value the continuous learning and the ability to manage intellectual curiosity throughout life.	9. Appreciate the continuous learning and the capacity to maintain intellectual curiosity throughout life.
8. Achieve highest standards of professional performance as biotechnologist.	11. Exhibit highest standards of professional endeavor as biotechnologist.



					ARS Gra	aduates A	Attribute	es			
Programme Aims	1	2	3	4	5	6	7	8	9	10	11
1. Study the information and application in various disciplines of biotechnological science to improve the quality of life.	x	~	80	RSC	IEN	CE	~				
2. Integrate biotechnological knowledge and skills into practices, designing and execution of guided projects.	15	2	x	B 1	DTE	100	R.	1			
3. Employ comprehensive research, laboratory procedures, quality control and create new valuable products.	\$/	2		x		1	2	2)			
4. Consider the ethical, social and legal issues related to applications of biotechnology and demonstrate awareness of biohazard and safety regulations and procedures related to applications of biotechnology.	15	2			x	X	56Y	LOGY			
5. Recognize the accumulated knowledge in the field of biotechnology and gain experience in basic administrative skills, information processing and data management for quality planning.		x	N.				x	1,			
6. Acquire critical thinking, innovation, creativity and problem-solving skills to be enrolled successfully in the postgraduate studies.		4	Vow.	•		ONE	7	x		x	
7. Value the continuous learning and the ability to manage intellectual curiosity throughout life.			17		Č	3			х		
8. Achieve highest standards of professional performance as biotechnologist.			~	9	~	-					х

Matrix between Biotechnology Program Aims and ARS Graduate Attributes

Annex III Matrix between ARS ILOS

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Biotechnology Programs ILOS

Matrix between ARS ILOS and Biotechnology Program ILOS

	ARS ILOS		Program ILOS
	A. Knowledge	and	Understanding
1.	Biotechnological and related sciences.	A.1.	Recognize interdisciplinary basic sciences biotechnology (Chemistry, Biophysics, Biology, Mathematics, Scientific Thinking, etc.).
		A.2.	Identify the biological concepts from molecular to cellular level.
		A.3.	Describe biochemical, genetic and molecular mechanisms and functions in different organisms.
2.	Basis of biotechnological activities, procedures, in-puts, out-puts and	A.4.	List the biotechnological activities and procedures.
	outcomes.	A.5.	Identify the biotechnological in-puts.
		A.6.	Recognize the biotechnological out-puts and out-comes.
3.	Value of biotechnological applications on quality of life and recognize the involved risks and	A.7.	Recognize the applications of biotechnology in cancer biology, molecular diagnosis, forensic medicine.
	biohazards.	A.8.	List the applications of biotechnology pharmaceutical and industry fields.
		A.9.	Re-call the applications of biotechnology in environment field.
		A.10.	Identify the applications of biotechnology in agriculture.
		A.11.	Demonstrate the health and safety practices in laboratories and samples handling.
	1 AVIE	A.12.	Identify the risks and biohazard of biotechnological applications and processing.
4.	Self-learning and practice the concept of lifelong learning to deal with accumulated amount of	A.13.	List the general information in biotechnology through Self-learning and practice of lifelong learning.
	information in biotechnology.	A.14.	Accumulate basic digital information and bioinformatics.
5.	Ethical, Legal, and social issues associated with biotechnology.	A.15.	Differentiate between moral, ethical and legal biotechnology issues.
		A.16.	Evaluate the regulatory policies in biotechnology research.
		A.17.	Know the sustainable needs and impacts of biotechnological solutions on environment and societal context.

-			
6.	Innovation, creation, and problem- solving approaches in multi- disciplinary situational analysis.		the problem-solving approaches ent biotechnology fields.
		A.19. Select t disciplin biotech	
7.	Strategies of digital learning and basic of programing.	program	the computational skills, basics of nming and digital learning es necessary for analyzing data
8.	Global and cultural diversity issues in accordance to biotechnology.	diversi	n universal and the cultural ity issues in accordance to hnology.
9.	Basis of economics and administration of biotechnology applications.	manage	the basis of economics and ement in commercial nology applications.
	B. Inte	ectual Skill	S
1.	Asses and evaluate the impact of biotechnological applications on quality of life.	B.1. Deterr biotec health	hnological applications on
			the effects of environmental hnological applications.
	N N		e the effects of biotechnological ations on food security.
2.	Interpret data from different biotechnical disciplines and	B.4. Interpr biotec	ret data from different hnological disciplines.
	synthesis creative solutions		Il creative solutions in different hnological fields.
3.	Evaluate biotechnological products, in field and/or laboratories,	B.6. Apprai referei	ise biotechnological products nced to standards.
	referenced to standards.	labora culture and	
4.	Formulate hypothesis, and design scientific experiment		e the scientific methods to late the research questions and a scientific experiment.
5.	Formulate goals and objectives, utilizing biotechnological information and data, for quality	B.9. Formu utilizin and da	0 0
	planning.	inform	ze and evaluate evidence-based ation and data in field of hnology.

6.	Apply management and business techniques and practices appropriate to engineering industry.	B.11.	Administrate the industrial applications of biotechnology, and business practices.
	C. Practical ar	nd Prof	essional Skills
1.	Employ the theoretical knowledge and skills into practices in different biotechnological domains.	C.1.	Apply practical procedures in basic sciences (Chemistry, Biochemistry, Biophysics, Biology Genetics, etc.).
		C.2.	Perform biotechnology procedures in medical biotechnology within the scope of animal and human health care.
		C.3.	Apply biotechnology procedures in pharmaceutical and industrial products.
		C.4.	Manipulate biotechnology procedures in agriculture and food security.
	1.87.05	C.5.	Perform biotechnology procedures in environment preservation.
2.	Apply various biotechnological techniques, operate and maintain	C.6.	Apply standard operating procedures in biotechnology laboratories.
	equipment	C.7.	Manipulate different biotechnological techniques in molecular diagnosis of human and animal diseases, molecular diagnosis of plant diseases, molecular forensic medicine, etc
		C.8.	Acquire the practical skills of biotechnology equipment maintenance.
3.	Perform tissue culture procedures in sterilized environment.	C.9.	Operate animal tissue culture and plant tissue culture procedures in complete aseptic conditions.
4.	Carry out molecular biology and genetic engineering procedures and	C.10.	Apply appropriate tools and techniques in biotechnological manipulation
	techniques according to standards.	C.11.	Operate molecular genetic workflow.
		C.12.	Practice genetic engineering procedures and techniques according to standards.
5.	Monitor, Collect, record, categorize, catalogue, and archive scientific	C.13.	Monitor, collect and record scientific biotechnological data effectively.
	biotechnological data effectively.	C.14.	Categorize and archive effectively the scientific biotechnological data.
6.	Retrieve, analyze and evaluate relevant data from literature, using information technology, bioinformatics and library resources.	C.15.	Utilize information technology, bioinformatics tools and library resources to collect, interpret and asses the relevant data from literatures.

	D. General an	d Tra	nsferable Skills
1.	Communicate effectively using variety of media.	D.1.	Apply communication skills in inter professional and social context
2.	Collaborate effectively within team and set priorities.	D.2.	Work productively and cooperatively within a team.
		D.3.	Be able to set priorities
3.	Demonstrate effective time and resources management.	D.4.	Use available resources and manage time effectively
4.	Demonstrate lifelong learning, self- learning, and self-evaluation.	D.5.	Appraise continues learning and develop self-education and self-evaluation skills
5.	Adopt a creative attitude in an ethical and scientific approach.	D.6. D.7.	Acquire creative thinking and problem- solving techniques in an ethical and scientific manner. Respect society, human and animal rights in biotechnological applications.
6.	Recognize professional responsibility towards communities	D.8.	Conduct priorities for professional responsibility towards communities
7.	Use software and digital data-basis effectively.	D.9.	Use relevant information technologies efficiently
	W	D.10.	Utilize relevant data-basis in different biotechnological activities
8.	Present and discuss information fluently	D.11.	Prepare, present, and discuss information and data professionally.

Matrix between ARS ILOS and Biotechnology Program ILOS

																				_	Pr	ograi			led Lea	urning	g Out	come	es (II	.OS)																		
	ARS ILOS	Δ1	A2 /	43 44	Δ5	A6	A7		Knowl						6 A17	A18	A19 A	20 421	A22	B1	B2	B3 1			al Skills B7 B	B RO	B10	B11	CI	C2 4	3 64			ional a				12 C13	C14 C	C15	DI				ransfer 06 D7			10 1011
	1. Biotechnological and related sciences.			x	~~~	740	~	-	~ ~			- A12	A14 /	1.5 A	5 AI7								u- u.				10		<u> </u>				co	C/ C		CIU	cri c.	2 015			5. 5	a 10			0 07	200	0, 0	0 011
	2. Basis of biotechnological activities, procedures, in-puts, out-puts and outcomes			x	x	x												de la			15			E																								1
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	 Formulate goals and objectives, utilizin biotechnological information and data, for quality planning. 	g																								x	x									5												
	6.Apply management and business techniques and practices appropriate to engineering industry.																											x																				
	1. Employ the theoretical knowledge and skills into practices in different biotechnological domains.																												x ,	x x	x	x																
Skills	2. Apply various biotechnological techniques, operate and maintain equipment	t						_																	.								x	x x														
action :	3. Perform tissue culture procedures in sterilized environment.																																		х													
ional and Practical Skills	 Carry out molecular biology and genetic engineering procedures and techniques according to standards. 	ic																																		x	x x											
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	 Retrieve, analyze and evaluate relevant data from literature, using information technology, bioinformatics and library resources. 								١.				X		Ť,	b									0				9	2	ľ				l				х	ĸ								
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	Collaborate effectively within team and set priorities.										٩.						۰.		-					1									2								x	x						
e Skills	3. Demonstrate effective time and resources management.																																										х					
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D. Gen	6. Recognize professional responsibility towards communities																																													x		
	7. Use software and digital data-basis effectively.																																						\square							Ĭ	x x	
	8. Present and discuss information fluent	ly																						1															Ш		⊥				\bot	Ш	⊥	x

Annex IV Matrix Between Program Aims and Program ILOS

Matrix Between Program Aims and Program ILOS

Programme Aims						-							Une															llect													and									D. C	Gener	ral a	nd 1	Fran	sfera	able	Ski	lls
Trogramme Trans	A1	A2	2 A.	3 A	4 A	.5 A	6 A	17	48	49	10 A	11 A	12 A	13 A	14 A	15 A	16 A1	7 A1	8 A 1	9 A2	0 A2	1 A2	2 B	1 B	2 B	3 B4	4 B5	5 B6	B7	B 8	B 9	B10	B11	C1	C2	C3	C4	C5	C6	C7	C8	C9 (C10 0	C11 0	C12	C13	C14 C	C15	D1	D2	D3 1	D4 I	D5 I	06 D	7 D	8 D	9 D1	10 D1
 Study the information and application in various disciplines of biotechnological science to improve the quality of life. 	x	x	x	x	c >	x 2	x :	x	x	x	x	x	x >	c >	x	¢ 2	x x	x	x	x	x	x		x ,	<				x			5	121	140.0	d		20																					
2. Integrate biotechnological knowledge and skills into practices, designing and execution of guided projects.	L			x	¢		:	x	x	x	x :	x 2	ĸ			1	x	x	5)	,	x	x	x	x	x	x	x	x	x	1				1		CO.	5.707																		
3. Employ comprehensive research, laboratory procedures, quality control and create new valuable products.										1		5		(x	x	x	x	x	x	x	x	x	x	x	x	x	x	x										
4. Consider the ethical, social and legal issues related to applications of biotechnology and demonstrate awareness of biohazard and safety regulations and procedures related to applications of biotechnology.										0100		x 3	ĸ		2	¢																							x					2.2								:	x	x	x			
5. Recognize the accumulated knowledge in the field of biotechnology and gain experience in basic administrative skills, information processing and data management for quality planning.																				x	x	x		x >	< x	x	x	x	x	x	x	x												/												x	x	x
6. Acquire critical thinking, innovation, creativity and problem-solving skills to be enrolled successfully in the postgraduate studies.																		x	x	x						x	x			x	x	x	ŝ	1000			1				1	1										,	ĸ					
7. Value the continuous learning and the ability to manage intellectual curiosity throughout life.																						x								x	x	x					1	1		1												:	x					
8. Achieve highest standards of professional performance as biotechnologist.	x	x	x	x	. .	x 3	x :	x	x	x	x	x 3	x	x >	x >	, ,	x x	x	x	x	x	x	: ,	< >	< >	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x y	x x	x x	x x	x x

Annex V

Program ILOs vs Courses Matrix

1. Compulsoary Courses

											٨	Knor	vlodo	e and	Und	oreto	nding	•						
	Course Code	Course title	A1	A2	A3	A4	A5	A6	A7	A8	A. A9	A10	A11	1	1	1		1	A17	A18	A19	A20	A21	A22
	First Semester				110		110	110		110		1110			1110		1110	1110	1117	1110		1120		
	BIOT-101	Introduction to Biotechnology	1	1	15	1	1	0				1.4	C_{λ}	~	X	5								X
	MATH-101	Basics in Mathematics	x	2	7	1	5							V,	\mathbb{N}	14	N							
	BIOL-101	General Biology I	X		Γ.	X				1					1	10	5.1							
	CHEM-101	General Chemistry	X	27	1.0						÷.,		Х		0	N	4							
	BPHYS 101	Biophysics	X	1	O.										0		2							
	ENGL 101	English Language I	X		2.5												X							
First Level	COMP 101	Introduction to Computer Applications									X					x	λ£					x		
rst I	Second Semest																							
E	BIOL-102	General Biology II	x	Ę									2					/						
	GENE-102	Principals of Genetics			x	3										7								
	MICR-102	General Microbiology	X		y								X				1							
	OCHM 102	Organic Chemistry	Х				74			-			X	500	1		1							
	STAT-102	Biostatistics	Х					2_{kl}	Ø. 1.				00	1		1				X		Х		
	ENGL 102	English Language II	X		>		2	~	4. E	D	SE.	2	X			1								
	HUMN 102	Scientific Thinking													1					X				

						1		10	S D	5	CI	EA	1	The second second										
	Commo Co do	Course title									А.	Knov	vledg	e and	Und	lersta	nding	3						
	Course Code	Course title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
	First Semester																							
	MLGN 201	Molecular Genetics I	1	X	X	X	8						10	1	1	2								
	MCGN-201	Microbial Genetics	1	X	X	12	2							Y	1	12	1							
	BCHM-201	Biochemistry	X		Ľ.,	1				1	1				0	1	5.1							
	PLTC 201	Plant Tissue Culture	1	17	1	X						X			0	N								
Second Level	HMBL 201	Human Biology (Structure and Function of Human Body)	x		0.5				X						6	<	000							
ond	ENGL 201	English Language III	X																					
Sec	Second Semest	er																			•		•	
	MLGN 202	Molecular Genetics II			X	x	X	x	2									7			x			
	HPTH 202	Human Pathology					Х	X	X	-		•	2		-	1								
	CYGN 202	Cytogenetics				X			X								1							
	E1BC-202	Experimental Biochemistry	N		X	x	he.	1					X	R	.7		1							
	ANTC 202	Animal Tissue Culture				X	X	X					30	Ž										

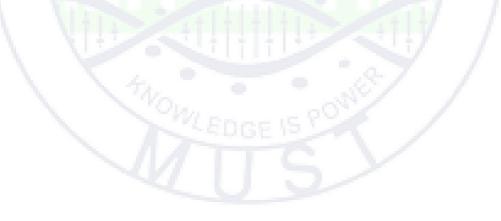
							1	100	10	5	C	150		-										
		Comme d'als									Α.	Knov	vledg	e and	l Und	ersta	nding	3						
	Course Code	Course title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
	First Semester																							
	GENG 301	Genetic Engineering I	1	1	5	x	X	x					57	12	ý	2	1				X			
	PRBT 301	Process in Biotechnology	1	4	1	X	5							20	$\sum_{i=1}^{n}$	N	5			X				
5	BINF-301	Principals of Bioinformatics	1	51		1									Sa	X	0			X		X		
l Level	PRPH 301	Principles of Pharmacology	00	1	0			x	1	х			Х		6	ı٦	6	λ.						
Third	Second Semest	er																						
	GENG 302	Genetic Engineering II				X	X	X	Ť	X	X	X		X			λŝ				X			
	GANL 302	Genomic Analysis								Х	X	X				X				Х		Х		
	CMBL 302	Cancer Molecular Biology			X	X			X															
	BEBS 302	Bioethics and Biosafety								ŀ			X	X		2/	X	X	X				X	

						1		10	NR.	- 53	CI	E.A.		No. of Concession, Name										
	Come Colle	George Cale									Α.	Knov	vledg	e and	l Und	lersta	nding	5						
	Course Code	Course title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
	First Semester																							
	PANL 401	Proteomic Analysis	1	1	0	1	10	5			Х	X	50		2	X								
	MLBS-401	Molecular Biology of Biotic and Abiotic Stresses	Γ,	x	x	4	2				1	X		Ye	$\sum_{i=1}^{n}$	Z	$\sum_{i=1}^{n}$		X					
	MLDG-401	Molecular Diagnosis of Human Diseases	9.7	2/	07	X	x	X	X		-				00	1	2			X				
Level	ENBT 401	Environmental Biotechnology	ŝ	1	0						X		X		1	6	X		X				X	
Fourth	RSBT-401	Research in Biotechnology I															Y	X	X	X	X			
H	Second Semeste	er																						
	BTSM 402	Biotechnology Seminar			-						1				X		X	1					X	
	CMBT-402	Commercial Biotechnology			Ŧ			X	-	X		Ŧ	5	1	-	1		1						X
	MLFM 402	Molecular Forensic Medicine				2	1		X				/	1		7								
	RSBT-402	Research in Biotechnology II	\mathbb{N}		X		he.							18	7		/							

	Course Code	Course Title]	3. Int	ellect	ual Sk	ills			
			B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
		First Semester											
	BIOT-101	Introduction to Biotechnology	1		X	10	~	3					
	MATH-101	Basics in Mathematics	X				2.1	0	1				
	BIOL-101	General Biology I					5	7		X			
	CHEM-101	General Chemistry				X	51	10	2.1				
	BPHYS 101	Biophysics		/		X	-4.	1.5	\mathbf{D}				
<i>'e</i> l	ENGL 101	English Language I							<				
Lev	COMP 101	Introduction to Computer Applications									X	X	
First Level		Second Semester											
E	BIOL-102	General Biology II	X	· .									
	GENE-102	Principals of Genetics										X	
	MICR-102	General Microbiology			1		23/	X	1				
	OCHM 102	Organic Chemistry				X	1		1				
	STAT-102	Biostatistics	•			X	1	1		X			
	ENGL 102	English Language II			. a0	2		1					
	HUMN 102	Scientific Thinking	500	E IS	2					X			

]	B. Int	ellecti	ial Sk	ills			
	Course Code	Course Title	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
		First Semester						•	•				
	MLGN 201	Molecular Genetics I			200	44	$\sim c$	\mathbb{R}^{n}	X				\square
	MCGN-201	Microbial Genetics				X	1	1/2					
	BCHM-201	Biochemistry	X				2	(K)	1				
	PLTC 201	Plant Tissue Culture					0	17	X				
Second Level	HMBL 201	Human Biology (Structure and Function of Human Body)	X				6	10	\mathbb{Z}				
pu	ENGL 201	English Language III				X							1
eco		Second Semester				<u>.</u>				1	1		
S	MLGN 202	Molecular Genetics II					X						
	HPTH 202	Human Pathology	X			Х			X				
	CYGN 202	Cytogenetics	X										1
	E1BC-202	Experimental Biochemistry			1.2	X	11	1	1				1
	ANTC 202	Animal Tissue Culture							X				

							B. In	tellectu	al Ski	ls			
	Course Code	Course Title	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
		First Semester											
	GENG 301	Genetic Engineering I				X	X	\mathbb{R}^{1}					X
	PRBT 301	Process in Biotechnology				1.00	5	X		X			X
vel	BINF-301	Principals of Bioinformatics				X	2	(m			X	X	
Level	PRPH 301	Principles of Pharmacology					X	X					
ird		Second Semester				1	<u>. </u>			<u> </u>			
Third	GENG 302	Genetic Engineering II					X -	X	5.1				X
	GANL 302	Genomic Analysis				X			21		X	X	
	CMBL 302	Cancer Molecular Biology	X			Χ			X				
	BEBS 302	Bioethics and Biosafety	1.1	X	X			X					



	Course	G (14)						C. I	Profes	siona	al and	l Pract	ical Skil	lls			
	Code	Course title	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	F	First Semester															
	BIOT-101	Introduction to Biotechnology	87	3	, C	T	(C2 1		£(14	\geq	So.	\mathbf{N}				
	MATH-101	Basics in Mathematics	0	2							0	\mathbb{N}^3	21				
	BIOL-101	General Biology I	X					X				\circ	2				
	CHEM-101	General Chemistry	X					X				0	5				
	BPHYS 101	Biophysics	X									4	1X				
	ENGL 101	English Language I	X										12				
First Level	COMP 101	Introduction to Computer Applications				3											X
Fir	Se	cond Semester								1			1		1	1	
	BIOL-102	General Biology II	X							-		1.7					
	GENE-102	Principals of Genetics	x	1					<	*	4	7	/				
	MICR-102	General Microbiology		N.	0	14 m			. 0	x	2						
	OCHM 102	Organic Chemistry	X				ne	X	2			/					
	STAT-102	Biostatistics	~	. /	1						~						
	ENGL 102	English Language II	X		44												
	HUMN 102	Scientific Thinking				-									X		

1. Compulsoary Courses (cont.)

				1		2 B	SI	C15	140		-						
	Course	Course title						C. P	rofes	siona	l and	l Practi	ical Skil	lls			
	Code	Course the	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	F	first Semester															
	MLGN 201	Molecular Genetics I	x	x	2			17	x	14	2	x	x				
	MCGN-201	Microbial Genetics		1				X	X		2	X	KA				
	BCHM-201	Biochemistry	X									0 \	2				
	PLTC 201	Plant Tissue Culture	9			x	x				x	0	10				
l Level	HMBL 201	Human Biology (Structure and Function of Human Body)	x						x				3Y				
Second Level	ENGL 201	English Language III			>							=1+/					X
	Se	cond Semester															
	MLGN 202	Molecular Genetics II	<	4				X	0	x	8	x	X				
	HPTH 202	Human Pathology		X	O_{L}	la			X	08	1		/				
	CYGN 202	Cytogenetics	X		1	14	DG	X	53	1		/					
	E1BC-202	Experimental Biochemistry	1	1	x			X		x	5	/					
	ANTC 202	Animal Tissue Culture									x						

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	-		_	1		3R	SI	<u>C14</u>	1.6.5	_	Sec.						
	Course	Common didle						C. F	Profes	siona	l and	l Practi	cal Skil	ls			
	Code	Course title	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	F	First Semester															
	GENG 301	Genetic Engineering I	1	6				x		4	2	x	$\sum_{i=1}^{n}$	X			
	PRBT 301	Process in Biotechnology	3	1	X						~	N	61				
	BINF-301	Principals of Bioinformatics	ē.									0	6		X	X	x
Third Level	PRPH 301	Principles of Pharmacology			X		>	\leq		X			12				
Lhir	Se	cond Semester															
	GENG 302	Genetic Engineering II				2			•	X	x	X		X			
	GANL 302	Genomic Analysis		b)			-					: 17			X	X	X
	CMBL 302	Cancer Molecular Biology		x					x			Y	/				
	BEBS 302	Bioethics and Biosafety	~	2	0.		٠		•	de la	9						x

		-	1		100	12	SC	IE.	1 m	1							
	Course	Course title						C. Pr	ofess	ional	and	Practio	al Skill	s			
	Code	Course title	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	F	First Semester															
	PANL 401	Proteomic Analysis	ē/.,	8					1	12.	N	0,					
	MLBS-401	Molecular Biology of Biotic and Abiotic Stresses	4	2		x	x	x	x			13	x				
	MLDG-401	Molecular Diagnosis of Human Diseases	o ,	X				x	X			2)	00				
level	ENBT 401	Environmental Biotechnology					X						~				
Fourth Level	RSBT-401	Research in Biotechnology I			•	2										X	X
L L	Se	cond Semester															
	BTSM 402	Biotechnology Seminar	1	-			1		/			7					
	CMBT-402	Commercial Biotechnology	1	$t_{N_{i}}$			•		-0	18	/		/				
	MLFM 402	Molecular Forensic Medicine		7	5	- 81	G	x	2	<		/	X				
	RSBT-402	Research in Biotechnology II	1	4						~					X	X	X

	Course Code	Course title				1	1	1		rable S	1		1
			D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D1
		First Semester								-			
	BIOT-101	Introduction to Biotechnology			1		14	\sim	24	x			
	MATH-101	Basics in Mathematics			-			X	10				
	BIOL-101	General Biology I		X				0	NY				
	CHEM-101	General Chemistry		X				0		51			
	BPHYS 101	Biophysics						X –					
el	ENGL 101	English Language I											X
First Level	COMP 101	Introduction to Computer Applications									X		
Fir		Second Semester											
	BIOL-102	General Biology II	- 19						X				
	GENE-102	Principals of Genetics		X									
	MICR-102	General Microbiology		X	IT			1					
	OCHM 102	Organic Chemistry		X			Q	. 7		/			
	STAT-102	Biostatistics	len.				380	1	1		X	X	
	ENGL 102	English Language II	-W	100		201	X		1				X
	HUMN 102	Scientific Thinking		200	SE 1	2		X	1				X

	Common Cr. J.	Commo title	D. General and Transferable Skills														
	Course Code	Course title	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11				
	MLGN 201	Molecular Genetics I					X	\sim	2.1								
	MCGN-201	Microbial Genetics			X		14	5 1	120	1							
	BCHM-201	Biochemistry		X				2	14	1							
	PLTC 201	Plant Tissue Culture				X		0	\mathbb{N}	6 N							
Second Level	HMBL 201	Human Biology (Structure and Function of Human Body)						9		X							
ond	ENGL 201	English Language III											X				
Sec		Second Semester															
	MLGN 202	Molecular Genetics II	6.2				X										
	HPTH 202	Human Pathology			X			X	4								
	CYGN 202	Cytogenetics				X	-		1	1							
	E1BC-202	Experimental Biochemistry			x	x	• , 0	7		/							
	ANTC 202	Animal Tissue Culture				X	100	1	X				1				

	-		-01	1.5	WIE.	No.	~						
	Course Code	Course title				D. Ge	eneral	and Tr	ansfer	able S	kills		
	Course Code	Course the	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
		First Semester											
	GENG 301	Genetic Engineering I			17		X	19	$c \lambda$				
	PRBT 301	Process in Biotechnology		/		X	10	\mathbb{N}	2				
_	BINF-301	Principals of Bioinformatics						0)	19	1	X	X	
Third Level	PRPH 301	Principles of Pharmacology	-	X				k S	18				
Chir		Second Semester											
	GENG 302	Genetic Engineering II							X	X			
	GANL 302	Genomic Analysis		-	-						X	X	
	CMBL 302	Cancer Molecular Biology				Ň	x		X				
	BEBS 302	Bioethics and Biosafety	X	111				X	X	/			

	Course Code	Course title				D. Ge	eneral	and T	ransfei	able S	kills						
	Course Code	Course the	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11				
		First Semester															
	PANL 401	Proteomic Analysis				£	1	1	14		X	X					
	MLBS-401	Molecular Biology of Biotic and Abiotic Stresses						2	N	X							
	MLDG-401	Molecular Diagnosis of Human Diseases		-			X		x	00							
level	ENBT 401	Environmental Biotechnology	Х							\geq							
Fourth Level	RSBT-401	Research in Biotechnology I	X	3	x	x	X	X	x	X	X	X	x				
Ε		Second Semester								1			1				
	BTSM 402	Biotechnology Seminar	Χ				X		. /								
	CMBT-402	Commercial Biotechnology	X			1		4	1	x							
	MLFM 402	Molecular Forensic Medicine	Oh	1. 100			0Ľ	2	x								
	RSBT-402	Research in Biotechnology II	X	- GL	x	x	x	X	x	x	x	X	x				

							_	17						-	-					D I		1.01.1					D			D	. 101	-11		-	T	C			T		11.0		_
	Course Code Course title			A. Knowledge and Understanding B. Intellectual Skills C. Professional and Practical Skills C. Professional and Practical Skills											D. General and Transferable Skills																												
			A1 A	12 A3	A4 .	A5 A	6 A7	A8	A9 A10) A11 A	A12 A13	3 A14 A	.15 A16	A17 A	18 A1	9 A20 /	A21 A2	22 B1	B2 B	3 B4	B5 B6	B7 B	8 B9 I	310 B11	C1 C	2 C3 (24 C:	6 C6 C	C7 C8	C9 C	10 C11	C12 C1	3 C14	C15	D1 D	02 D3	3 D4	D5	D6 D	07 D8	; D9	D10	<u>/11</u> To
		First Semester		_		_	_						_			_		_	-							1 1	-		-											_			
	BIOT-101	Introduction to Biotechnology		_		_	_				X		5.		-	_	Х	ί	Х	(-	-	_				_		_					_	_		_	<u> </u>			4
	MATH-101	Basics in Mathematics	X	_		_	_						_		_	_	_	X		_					_		_		_		_					_	_		Х	_			з
	BIOL-101	General Biology I	X	_																		Х	(X		_	X							2		_			\perp			5
	CHEM-101	General Chemistry	X							X					_		_		_	X			_		X			X						_		X	+		-	_			6
	BPHYS 101	Biophysics	X												_		_	_		X		5	_		X									_		+	+		X	_			4
vel	ENGL 101	English Language I	X							l line f															X		<u> </u>										_						X S
Le	COMP 101	Introduction to Computer Applications							10			x	1.0			х							x	х			з.,							х							x		6
First Level		Second Semester																																									
훕	BIOL-102	General Biology II	X				T	1 1										x							х									_	-	T	Т		17	ĸ			4
	GENE-102	Principals of Genetics		x																				x	x										,	x	1						4
	MICR-102	General Microbiology	x							x											x								x					-	,	x	1		-	+	1		5
	OCHM 102	Organic Chemistry	x	-	1					v			-				-			v					x			v				-	1	-	,		+	1	-	+	+	-	6
	STAT-102	Biostatistics	X	+	++								_	++	x	x				X		X			^		+	1				-	+	+	Ť	+	+	+	+	+	x	х	7
	51A1-102 ENGL 102	English Language II	X	_	+		+	++		++		++	_	++	^	-			-	-			++		x	+	-						+	+	+	+	+	+	+	+	+	_	X 3
	HUMN 102	Scientific Thinking		_	+			++		++		++	_	++	x	+			-			X			^	++	+					v	+	+	+	+	+	+	v	+	╉╼┦	_	X 5
	HUMIN 102	ě			1 1			- 1	_	<u></u>		1 1		<u> </u>	<u> </u>	1 1							<u>• </u>					1 1	- I -	<u> </u>		1		\rightarrow	_	<u> </u>	_	<u> </u>	<u> </u>		ليسد		<u></u>
	MLCN 201	First Semester Molecular Genetics I	- I.	x x	x		-	<u> </u>	-	1 1	-	1 1	-	<u> </u>	-		-	-	-	11	-	v			X X	— —	-	1 1	~				1 1	-	—	4	—	- V -	-	—			1
	MLGN 201	Molecular Genetics 1 Microbial Genetics		X X X X			+	++		+		++	_	\vdash	_	+	_			x		А	++		A X	++	-	x	x		X X	-	+	+	+		+	А	+	+	+ +	\vdash	7
	MCGN-201 BCHM-201	Biochemistry	x	A X	+	-	+	++		++		++		\vdash	_	++	_	v		Λ	_	\vdash	++		v	++	_	Α.	^	2			+	+	+	$+^{x}$	4	\vdash	+	+	+ +	\vdash	4
			х		1		-	+		++		++		\vdash	_	+		л		+			++		х	++		++	_			_	+	-	+	4	+_	\vdash	\rightarrow	+	+		
e	PLTC 201	Plant Tissue Culture	\vdash	_	х	-	-	++	X	++		++		\vdash	_	++				+		X	++			++	x x	+	_	х			+	\rightarrow	+	+	X	\vdash	+	—	╇┩	\square	7
Lev		Human Biology (Structure and																																									6
Ę	HMBL 201	Function of Human Body)	X	_	_	_	X	_		+			_		_		_	х	_						X		_		x			_				_	+			<u>x</u>	_		
Second Level	ENGL 201	English Language III	X										_					1.0		X									_		1.1			x	┶	┶	┶		┶	┶			X 4
Sec		Second Semester		_			-		_	_	_		_		_		_	_					_				_		_		_	_		_						_	4		
	MLGN 202	Molecular Genetics II		X	X								_		X	_	_				X						_	X	X	2	(X					_	_	X	_	_			1
	HPTH 202	Human Pathology				X X	_	_							_		_	X	_	X		X			X		_		X							X	<u> </u>		х	_			1
	CYGN 202	Cytogenetics			х		X											X	_	_					X			X									X			\perp			6
	E1BC-202	Experimental Biochemistry			х					X										X						X		X	X							X	X						8
	ANTC 202	Animal Tissue Culture			х	X X	(X								X							X			٢			7
		First Semester																																									
	GENG 301	Genetic Engineering I			X	X X	1								X					X	X			X				X		2	ζ	X						х					1
	PRBT 301	Process in Biotechnology			X										X						X	Х	ζ	х		X											X						7
vel	BINF-301	Principals of Bioinformatics										X			X	X				X			X	х								X	X	X							X	X	1
Ľ	PRPH 301	Principles of Pharmacology				X		х		X											X X					X			X						J	Х							8
Third Level		Second Semester																																									
Th	GENG 302	Genetic Engineering II			х	X X	1	X	X X		X				X						X X			X					X	X Z	(х				T	T		7	x X	П		1
	GANL 302	Genomic Analysis						х	X X			х			X	X				X			Х	X			-					Х	х	х		1	T				X	X	1
	CMBL 302	Cancer Molecular Biology		X	X		x											X		X		X			Х		F		x					1		1	T	х	,	x			1
	BEBS 302	Bioethics and Biosafety			11			\square		x	x		x x	x			х		X X	(x													x	X	+	1		XZ	x	+		1
		First Semester			·					• •				•									<u> </u>							_						<u> </u>	-						
	PANL 401	Proteomic Analysis		T	TT		T		X X	11		X				1				x	x		111				T	П					TT	-	T	T	T		T	T	x	x	7
		Molecular Biology of Biotic and			1 1		1	11		11		+								+						+	-							+	-	+	1	+	+	+	+		
	MLBS-401	Abiotic Stresses		x x	11			11	x	11				x					X	c x		x					x x	x	x		x									x			1
7		Molecular Diagnosis of Human	H		++			+	1	++		++				+	+	1 1	- 1 -							++	-	1	-	\vdash	-		+	+	+	+	+	+	+	+	+	\vdash	
eve	MLDG-401	Diseases			x	x x	x								x			x		x		x		x	x			x	x									x	•	ĸ			1
		Environmental Biotechnology	\vdash				1	++	x	x		++		x			x	-	x				++				x		-	\vdash			+	+	x	+	+		Ť	+	+	\vdash	7
ŧ	RSBT-401	Research in Biotechnology I	\vdash		++			++				++	x	X	x v	+				++		X	K X		-	1 1	-	++		\vdash			х	x	X	v	v	х	x T	x x	x	х	X 1
Fourth Level	K551-401	Second Semester			1 1	_	-	- 1				1 1	1 ^	141	- 1 A				_		_		• • •				-	1 1					1	<u> </u>	<u> </u>	<u>^</u>	1^		<u> ~ L</u>	<u>. 1 v</u>	1	A	
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	DTSM 402									1 1	A	1	A			1	л						A .	A						1 1					A			- A		1	1		
	BTSM 402	Biotechnology Seminar		_	+			v										r .					v	VV		+ +							+ +	_	v		_		_	**			
	CMBT-402	Commercial Biotechnology			\square	X		x		\square	_						Х	٢					X	X X		Ц			_				Ц	_	X	-			_	X	\square		8
	CMBT-402 MLFM 402	Commercial Biotechnology Molecular Forensic Medicine				X	x	x				\square	+				X	(X		x						x			x			_					,	x c	\square		6
	CMBT-402	Commercial Biotechnology	13			X	x	x									X		1	X X	x x	x		X X X				x			x	x	x	_		x	x	x	у х у	x x x x	x	x	

2. Elective Courses

	Course Code	Course Title									A	. Kno	wledg	ge and	Unde	rstan	ding							
	Course Coue	Course The	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
	ARAB 101E	Arabic Language		1	.4	2	1	$\mathcal{C}_{\mathcal{C}}$	5					- C /	X	2	0	1						
	HUMN 101E	Behavioral Psychology	X	1	1.	7	15	2×					£.		1	2	0	12						
	PHYS 101E	General Physics	Х	2	1		2									1	X	3	Υ.					
	BIOT 201E	Concepts and Issues in Biotechnology	1		1	õ						2				0	X	ž	$\langle \rangle$		X		x	
	CBIL 202E	Comparative Biology	2	Х	1	1											1	1.5	1					
	CBPH 203E	Cell Biology and Physiology	x	x								Y							2					
Elective Courses	COPR 204E	Computer Programming I														X				X		X		
tive C	COPR 205E	Computer Programming II														X				X		X		
Elect	ENMC 206E	Environmental Mutagens and Carcinogens	$\langle \cdot \rangle$		x	Ŧ	1					H	-	X	/		11/		/					
	EVPG 207E	Evolution and Population Genetics	\sim		~		1							/			17		1	X				
	GNEM 208E	General Embryology				X			X						K	- 7	1	3						
	GNHT 209E	General Histology		X			1	74	X						150	1		1						
	HUPH 210E	Human Physiology			1				х	11 1	1. July 1.			90	1									
	PBRD 211E	Plant Breeding									ŝ	х	1-1				1							
	PPTH 212E	Plant Pathology			х		· · · ·		7.			X				1				Х				

2. Elective Courses (Cont.) FOR SCIENC

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	Course Code	Course Title									A	. Kno	wledg	ge and	Unde	erstan	ding							
	Course Code	Course The	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
	ANBR 301E	Animal Breeding		1	3	2.	1	X		X			5	100	2.	N	0	~						
	APTH 302 E	Animal Pathology		1	17	1	25	2	X			1	X		-W	2	3	5						
	BGMD 303E	Biochemical Genetics of Metabolic Diseases	/	ίų.	x	1	ž				/					1	\mathbb{N}	6	\mathbf{X}	x				
	BHGN 304E	Behavioral Genetics	11	1	1	O.				1							x	1.5	х				Х	
\$	BMBF 305E	Biomass and Biofuel	0	ñ.	1	X					X						1	1.5	6.1					
e Courses	CHPE 306E	Chemistry of Proteins and Enzymes	x									Y							Y.					
Elective	IMMN 307E	Immunology		X	X																			
Ele	INVF 308E	In vitro Fertilization and Embryo Transfer				X	x	X									x	x						
	MLEP 309E	Molecular Epidemiology	N.					X	X							Ŧ	17		1	x				
	NABT 310E	Nanobiotechnology				X				X	X	X	х		-		1		1					
	PHCG 311E	Pharmacognosy				1		X		X					1	-1		1						X
	SCBT 312 E	Stem Cell Technology		x			~	1	Ö.	1				-0	18	/	x	x			X			

	C										Α	. Kno	wledg	e and	l Und	erstar	ding							
	Course Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
	ANBT 401E	Animal Biotechnology		/	2	2	1	х	51	X	2.1	X	\mathcal{E}_{i}	×.	>	6	x							
	APMC 402E	Applied Microbiology	1	1.	2	1	1	4		X	X	X		2	de l	2	Ż.	1						
	BFBP 403E	Biofertilizers and Biopesticides	1	17	1	4	1				х	X			0	. `	2	$\sum_{i=1}^{n}$	X	Х				
	BRBD 404E	Bioremediation and Biodegradation	1	'n	Γ.	2					х		Х			0	$\langle \cdot \rangle$	2.	X					
s	GETH 405E	Gene Therapy	02		10				X							5	Х	5	1	X	X			
Elective Courses	MABT 406E	Marine Biotechnology	60	1	x					х						1		X						
tive C	MCBT 407E	Microbial Biotechnology			X	X	X	X			X	X						1						
Elec	MDBT 408E	Medical Biotechnology							х															
	MGGR 409E	Management of Genetic Resources and Gene Bank								2	x	X							x					
	PHBT 410E	Pharmaceutical Biotechnology				х		1		X			Х	X			7							X
	PHGN 411E	Pharmacogenomics			1		1	X		Х			Х			2.1								
	PLBT 412E	Plant Biotechnology	X							X		Х		X	10.	7	X	1						

	German Gerle	C					B. Int	tellectu	ial Ski	lls			
	Course Code	Course Title	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B1 1
	ARAB 101E	Arabic Language	0.			Х	1	52	~				
	HUMN 101E	Behavioral Psychology	X		11		14	1.	なく				
	PHYS 101E	General Physics		1		X	0	~	2	~			
	BIOT 201E	Concepts and Issues in Biotechnology		X	X			6	12	$\langle \rangle$			
	CBIL 202E	Comparative Biology					X	0	17	53			
S	CBPH 203E	Cell Biology and Physiology	X					1	17				
Courses	COPR 204E	Computer Programming I				X				2	X	X	
Col	COPR 205E	Computer Programming II				Χ					X	X	
Elective	ENMC 206E	Environmental Mutagens and Carcinogens	X			X						Х	
E	EVPG 207E	Evolution and Population Genetics			T.F.		/	1	/	X		X	
	GNEM 208E	General Embryology	Х		111			27/		1			
	GNHT 209E	General Histology	Х				°. C.	7					
	HUPH 210E	Human Physiology	X	•			50%	1	1				
Ī	PBRD 211E	Plant Breeding	Same		Х	00	1		1				
	PPTH 212E	Plant Pathology	100	5 D G	X	1			X				

	Correct Corle	Comme Title					B. Int	ellectu	ial Ski	lls			
	Course Code	Course Title	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
	ANBR 301E	Animal Breeding	20	51	X	F	~	14	~				
	APTH 302 E	Animal Pathology	Х		4	10.	5.	20	X				
	BGMD 303E	Biochemical Genetics of Metabolic Diseases	X		1		Y'O	X	Ser.)			
	BHGN 304E	Behavioral Genetics							O J			X	
ses	BMBF 305E	Biomass and Biofuel					X	5	15				
e Courses	CHPE 306E	Chemistry of Proteins and Enzymes	X			X		ΥĘ	15	21			
Elective	IMMN 307E	Immunology	X				X			2			
Ele	INVF 308E	In vitro Fertilization and Embryo Transfer	X				X	X					
	MLEP 309E	Molecular Epidemiology	Х			X			X			X	
	NABT 310E	Nanobiotechnology	Х	X									
	PHCG 311E	Pharmacognosy						X		1			
	SCBT 312 E	Stem Cell Technology	Х			X		1	X			X	

	Course Code	Course Title					B. In	tellectı	ial Ski	lls			
	Course Code	Course Thie	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
	ANBT 401E	Animal Biotechnology	X	BI	X	F	~	1	~				
	APMC 402E	Applied Microbiology	0		1	10.	X	50	>				
	BFBP 403E	Biofertilizers and Biopesticides			1		X		5				
S	BRBD 404E	Bioremediation and Biodegradation		x	1			$\langle \rangle$	20	\sum			
Courses	GETH 405E	Gene Therapy	X				X	2	15				
Cot	MABT 406E	Marine Biotechnology	X					1.0	10	2.1			
ive	MCBT 407E	Microbial Biotechnology		X				X	1.0	>1			
Elective	MDBT 408E	Medical Biotechnology	X							<			X
H	MGGR 409E	Management of Genetic Resources and Gene Bank		X									
	PHBT 410E	Pharmaceutical Biotechnology	X				X	X					
	PHGN 411E	Pharmacogenomics				X	X	X					
	PLBT 412E	Plant Biotechnology			X	1.1	X						

			1		1.30	1			12.23	2.6%							
	Course Code	Course Title	-	1	T	T		С. Р	rofess	ional	and P	ractical	Skills	T		1	
	Course Coue	Course The	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	ARAB 101E	Arabic Language	2	1	6 N				~ (de.	~	3			X		
	HUMN 101E	Behavioral Psychology	1	0				17		1	1	\mathbb{C}^{\times}	~				X
	PHYS 101E	General Physics	X	4			1				Ο,	χ	\mathbb{R}^{1}				
	BIOT 201E	Concepts and Issues in Biotechnology	N.	e -			4				~	2/	21				
	CBIL 202E	Comparative Biology	10									61.1	0				
	CBPH 203E	Cell Biology and Physiology	x					/				-4	2				
urses	COPR 204E	Computer Programming I													X	X	X
ve Coi	COPR 205E	Computer Programming II				. 3		-							X	X	X
Elective Courses	ENMC 206E	Environmental Mutagens and Carcinogens	H	x	2		-					14					
	EVPG 207E	Evolution and Population Genetics	Ň			6				2	3	7	/				
	GNEM 208E	General Embryology		X	Va.						1		/				
	GNHT 209E	General Histology		1	1	11.2	in a	- 1	X	-		1					
	HUPH 210E	Human Physiology	1	X		-	100		1			/					
	PBRD 211E	Plant Breeding				X					V		X				
	PPTH 212E	Plant Pathology				X		X		1							

						10		C. Pr	ofessi	onal a	and P	ractica	l Skills				
	Course Code	Course Title	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	ANBR 301E	Animal Breeding	1.4	Ζ,	1	X	- 1	215	X	50	1	16	~ ~				
	APTH 302 E	Animal Pathology	SU	X	16				0	200	40	1	0,1				
	BGMD 303E	Biochemical Genetics of Metabolic Diseases	1	x	3				x		1	0)	12	\sum			
	BHGN 304E	Behavioral Genetics	1 .	3								0	1	2.1			
es	BMBF 305E	Biomass and Biofuel	0				X					6	1 1	2			
Courses	CHPE 306E	Chemistry of Proteins and Enzymes	0	x				x	/				<	õ			
tive	IMMN 307E	Immunology		X													
Elective	INVF 308E	In vitro Fertilization and Embryo Transfer		x				x	•	x	x						
	MLEP 309E	Molecular Epidemiology		X		//			X		1	1	X				
	NABT 310E	Nanobiotechnology	X		X		X					X	1				
	PHCG 311E	Pharmacognosy			X						۰.			1			
	SCBT 312 E	Stem Cell Technology		~	TA.			•			Х	X		/			

						100	12	5.0	1.5	he have	_	1. Contract 1. Con					
	Course Code	Course Title						C. Pr	ofessi	ional a	and P	ractica	l Skills				
	Course Code	Course The	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	ANBT 401E	Animal Biotechnology	1.4	X	1	X		215	1.1	En	X	X	Χ				
	APMC 402E	Applied Microbiology	S	1	X	X	X		0	200	44	N	0				
	BFBP 403E	Biofertilizers and Biopesticides	1	4	3	x	X	/			1	0,	2	\mathbf{X}			
	BRBD 404E	Bioremediation and Biodegradation	1:	×.			X	50				So.	N	21			
es	GETH 405E	Gene Therapy	1.1	X				X	X			5		0			
Courses	MABT 406E	Marine Biotechnology	0					X	1			X	-	G			
ive Co	MCBT 407E	Microbial Biotechnology			X			X				X		~			
Elective	MDBT 408E	Medical Biotechnology		X	X			ŝ,									
	MGGR 409E	Management of Genetic Resources and Gene Bank				1				Y.	/		V				
	PHBT 410E	Pharmaceutical Biotechnology	N		x			x		X		X	1	1			
	PHGN 411E	Pharmacogenomics		1	X			0	-		A	\sim		1			X
	PLBT 412E	Plant Biotechnology		~	19	X				-	Х	1	1				

	Course Code	Course Title			D	. Gen	eral a	nd Tra	ansfer	able S	kills		
	Course Code	Course The	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
	ARAB 101E	Arabic Language	6.2			1	14	2	2				X
	HUMN 101E	Behavioral Psychology					14	X	X				
	PHYS 101E	General Physics			//			X	N.	~			
	BIOT 201E	Concepts and Issues in Biotechnology			N.			0	15	X			
	CBIL 202E	Comparative Biology						5	X	2.1			
ŝ	CBPH 203E	Cell Biology and Physiology				X				01			
Courses	COPR 204E	Computer Programming I						X		~	X	X	
	COPR 205E	Computer Programming II						X			X	X	
Elective	ENMC 206E	Environmental Mutagens and Carcinogens		. 2		2				X			
E	EVPG 207E	Evolution and Population Genetics	2				1		1	/	X	X	
	GNEM 208E	General Embryology				1	-			X			
	GNHT 209E	General Histology	- · · ·				1	X					
	HUPH 210E	Human Physiology	Ves.				120	1	X				
	PBRD 211E	Plant Breeding	1	VLEY	X	15.8	1		1				
	PPTH 212E	Plant Pathology			X		1.1	1					

				AR.	SCI	East	-						
	Course Code	Course Title			D	. Gen	eral a	nd Tra	nsfer	able S	kills		
	Course Coue	Course The	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
	ANBR 301E	Animal Breeding	0	ų.	510	TE,	~	5	Х				
	APTH 302 E	Animal Pathology	6		/		14.	2	Х				
	BGMD 303E	Biochemical Genetics of Metabolic Diseases					1	5	x	\backslash			
	BHGN 304E	Behavioral Genetics	X					0	X	1.1			
ses	BMBF 305E	Biomass and Biofuel		1		X		2	11	1			
e Courses	CHPE 306E	Chemistry of Proteins and Enzymes			x	X		1	< \	61			
Elective	IMMN 307E	Immunology							Х	Y			
Ele	INVF 308E	In vitro Fertilization and Embryo Transfer		X	ŝ.								
	MLEP 309E	Molecular Epidemiology			X			1	Х	X			
	NABT 310E	Nanobiotechnology	×			- 16	X	11	1				
	PHCG 311E	Pharmacognosy	1			X	1	1	7	1			
	SCBT 312 E	Stem Cell Technology				X	X	X		1			

2. Elective Courses (cont.)

	Common Condo	Course Title			D	. Gen	eral a	nd Tr	ansfer	able S	kills		
	Course Code	Course Thie	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
	ANBT 401E	Animal Biotechnology	0		-	24	~	Х	X				
	APMC 402E	Applied Microbiology		Х	1		N.	13	1.				
	BFBP 403E	Biofertilizers and Biopesticides		/		X	2	X	3				
S	BRBD 404E	Bioremediation and Biodegradation		\$	X			61	E.				
Courses	GETH 405E	Gene Therapy					X	4	X				
	MABT 406E	Marine Biotechnology			1	X			1 22				
tive	MCBT 407E	Microbial Biotechnology				X							
Elective	MDBT 408E	Medical Biotechnology							X				
	MGGR 409E	Management of Genetic Resources and Gene Bank	2			X		X		X			
	PHBT 410E	Pharmaceutical Biotechnology	X	X	X	2	X	17					
	PHGN 411E	Pharmacogenomics	Х			1		1	1				
	PLBT 412E	Plant Biotechnology	•				, Q	7	Х				

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								-		1.0	1.75																- 22										_								_
Course Code	Course Title										l Unde			-								-	ectual S		_	_					ssiona							D.	Gene	ral ar	id Tra	insfer:	able S	kills	
		Al A	A2 A3	A4	A5 A6	5 A7	A8 A	9 A10	A11	A12	A13 A	14 A1	5 A1	6 A17	A18	A19 /	A20 A	A21 A2	2 B1	B2 B	3 B4	B5 I	B6 B7	B8 B	89 B10	B11	C1 C2	C3 (C4 C5	6 C6	C7 C8	3 C9	C10	C11 (C14 C1	5 D1	D2 I	D3 D4	4 D5	D6 D	07 D8	8 D9	D10	Dl
ARAB 101E Arabic Lar	nguage										Х										Х	_					1.1		1						Х										X
HUMN 101E Behavioral	l Psychology	x				1		2	1. T		10			100				10	х			- L			1		10									Х					2	х			
PHYS 101E General Ph	hysics	X																			Х						Х										T				Х				
BIOT 201E Concepts a	and Issues in Biotechnology						1	100				Х	:			Х		Х		XX	K			1.0												_					\square	Х	(
CBIL 202E Comparati	ive Biology		X				10					1										Х		F												_					2	х			
CBPH 203E Cell Biolo	ogy and Physiology	X	X																Х					-			Х		1										Х		\square				
COPR 204E Computer	Programming I									11		X			Х		Х				Х			2	X X										X	X X					Х		X	X	
COPR 205E Computer	Programming II											X			Х		Х		-		Х			2	X X					1.0					X	X X					Х		X	X	
ENMC 206E Environme	ental Mutagens and Carcinogens		X							Х									Х		Х				Х		Х										T					Х	(
EVPG 207E Evolution	and Population Genetics														Х									Х	Х											-					\square	1	X	X	
GNEM 208E General Er						Х		-								T.			Х								X										\mathbf{T}	1			rt	Х	(++	_
GNHT 209E General Hi			X			X													Х		1				1		100	11			Х	1			1	1	11	1			Х	1	1	\mathbf{T}	_
HUPH 210E Human Ph						X		1					1					-	X								X					1					11	1			2	x	1	11	
PBRD 211E Plant Bree								X												2	ĸ								х					х			11		х			-			
PPTH 212E Plant Path			X					X							х					2	ĸ		Х						Х	Х							11		X			-			
ANBR 301E Animal B	reeding				X		Х													2	ĸ								х		х						11	1			2	х			_
APTH 302 E Animal Pa	athology					Х			Х										Х				Х				Х										11	1			2	х			
BGMD 303E Biochemic	cal Genetics of Metabolic Diseases		X												Х				х								Х				Х							, T			2	x			
BHGN 304E Behavioral	1 Genetics											X	:	Х				Х							X							1				_	х				>	x			
BMBF 305E Biomass a	and Biofuel			X			X															x							х							_			X		\square	1			
	of Proteins and Enzymes	X																	х		Х						Х		-	Х							11		XX			-			_
IMMN 307E Immunolo			хх																Х			х					Х										11	1			X	х			_
INVF 308E In vitro Fe	ertilization and Embryo Transfer			X	X X							X	X						Х			X	X				Х			Х	Х	Х					11	Х				-			_
MLEP 309E Molecular	Epidemiology				X	Х									Х				х		Х		Х		Х		Х				Х			Х				1	Х		X	xх	(
NABT 310E Nanobiote	chnology			x			x x	X	х										x	X								X	х				x			_				Х	\square				
PHCG 311E Pharmacos					x		X											X					x					X	-								11	1	X			-			_
SCBT 312 E Stem Cell			х									Х	X			Х			Х		X		X		X							Х	Х				11	1	X	X	Х	-			_
ANBT 401E Animal Bi					X		Х	Х				Х							Х	2	κ.						Х		х			Х	Х	Х			11	1			X 2	х			_
APMC 402E Applied M	ficrobiology						XX	X														х						X	хх								11	Х				-			_
BFBP 403E Biofertiliz							Х	X						Х	х							х							хх									, T	Х	:	\square	1			
BRBD 404E Bioremedi						1	X		х					X						х									X								11		X			1	1	11	_
GETH 405E Gene Ther						Х			1			Х			Х	х			X			х					X		1	Х	х	1					11	T I		Х		1	1	11	_
MABT 406E Marine Bi			X				Х						1						X											X		1	Х				\mathbf{T}	1	Х			1	1	11	_
MCBT 407E Microbial			X	X	XX	11	X	X												Х			X					х		Х		1	X			1	\mathbf{T}	1	X	_	rt	1		++	
MDBT 408E Medical B						Х										t			Х							Х	X	X				1				1	\mathbf{T}	1			2	x		++	
	ent of Genetic Resources and Gene Bank					T	Х	X				1.	1	Х		1				Х		11						T T				1					\mathbf{T}	1	X		X	х	(11	
PHBT 410E Pharmaceu				X			X	1	Х	х						1		X	х			X	X					X		х	Х	1	х				Х	X	X	Х		1	1	11	_
PHGN 411E Pharmacos					X		X	1	X							t					х	X	x					X				1				x	X	Ť			rt	1		++	
PLBT 412E Plant Biot				\square			X	х		х		x				1000				,	(x							х	\square		X				-	17	i t			3	x		++	

Annex VI

Courses specifications are attached in a separate file.

Annex VII

Comparative gap study between bylaw 2012 and 2018

Comparative gap study between bylaw 2012 and 2018

<u>1. Credit hours:</u>

Bylaw 2012: 160 Bylaw 2018: 144

2. Comparison of science ratios between the two bylaws

No.	Subject Areas	First cu	rriculum	Modified Curriculum				
INU.	Subject Areas	Cr. Hrs	Percentage	Cr. Hrs	Percentage			
1	Basic Sciences	30	18.7%	25	17.4%			
2	Core Biotechnology Sciences	68	42.5%	61	42.4%			
3	Capstone and Projects	9	5.6%	8	5.6%			
4	Discretionary Courses	24	15%	24	16.6%			
5	Humanities and Social Studies	18	11.3%	15	10.0%			
6	Information Technology	11	6.9%	11	7.6%			
	Total	160	100%	144	100%			



2. Comparison of courses between the two bylaws

	First Curi	riculum			Modified Curriculum								
Course Title	Course Code	Credit Hours	Teachi ng Level	Compulsory/ Elective	Course Title	Course Code	Credit Hours	Teaching Level	Compulsory/E lective				
English Language I	ENGL 101	3	1	Compulsory	English Language I	ENGL 101	3	1	Compulsory				
English Language II	ENGL 102	3	1	Compulsory	English Language II	ENGL 102	3	1	Compulsory				
English Language III	ENGL 201	3	1	Compulsory	English Language III	ENGL 201	3	1	Compulsory				
Introduction to Computer Applications	COMP 101	3	1	Compulsory	Introduction to Computer Applications	COMP 101	3	1	Compulsory				
Scientific Thinking	HUMN 102	3	1	Compulsory	Scientific Thinking	HUMN 102	3	1	Compulsory				
Introduction to Biotechnology	BIOT 101	2	1	Compulsory	Introduction to Biotechnology	BIOT-101	2	1	Compulsory				
General Biology I	BIOL 101	3	1	Compulsory	General Biology I	BIOL-101	3	1	Compulsory				
General Chemistry	CHEM 101	3	1	Compulsory	General Chemistry	CHEM-101	3	1	Compulsory				
General Microbiology	MICR 102	3	2	Compulsory	General Microbiology	MICR-102	3	2	Compulsory				
Principles of Genetics	GENE 102	3	2	Compulsory	Principles of Genetics	GENE -102	3	2	Compulsory				
General Biology II	BIOL 102	3	2	Compulsory	General Biology II	BIOL-102	3	2	Compulsory				
Organic Chemistry	OCHM 102	3	2	Compulsory	Organic Chemistry	OCHM-102	3	2	Compulsory				
Biochemistry	BCHM 201	3	3	Compulsory	Biochemistry	BCHM-201	3	3	Compulsory				
Microbial Genetics	MCGN 201	3	3	Compulsory	Microbial Genetics	MCGN-201	3	3	Compulsory				
Principals of Bioinformatics	BINF 301	3	5	Compulsory	Principals of Bioinformatics	BINF-301	3	5	Compulsory				
Cancer Biology	CBIL 302	3	6	Compulsory	Cancer Molecular Biology	CMBL 302	3	6	Compulsory				
Molecular Diagnosis and Gene Therapy	MLDG 401	3	7	Compulsory	Molecular Diagnosis of Human Diseases	MLDG 401	3	7	Compulsory				
Molecular Biology of Biotic and Abiotic Stresses	MLBS 401	3	7	Compulsory	Molecular Biology of Biotic and Abiotic Stresses	MLBS 401	3	7	Compulsory				
Genomic Analysis	GANL 401	3	7	Compulsory	Genomic Analysis	GANL 401	3	7	Compulsory				
Research in Biotechnology I	RSBT 401	3	7	Compulsory	Research in Biotechnology I	RSBT 401	3	7	Compulsory				
Research in Biotechnology II	RSBT 402	3	8	Compulsory	Research in Biotechnology II	RSBT 402	3	8	Compulsory				

2.1. Courses found in the two bylaws

2.2. Courses that changed from elective courses in bylaw 2012 to complusoray courses in bylaw 2018

	First Cu	rriculum			Modified Curriculum								
Course Title	Course Code	Credi t Hours	Teachin g Level	Compulsor y/Elective	Course Title	Course Code	Credit Hours	Teachin g Level	Compulsor y/Elective				
Human Biology	HMBL 204E	3		Elective	Human Biology (Structure and Function of Human Body)	HMBL 201	3	3	Compulsory				
Human Pathology	HPTH 202	3		Elective	Human Pathology	HPTH 202	3	4	Compulsory				
Introduction to Pharamacology	INPH 309E	3		Elective	Principles of Pharmacology	PRPH 301	3	5	Compulsory				
Molecular Forensic Medicine	MLFM 411E	3		Elective	Molecular Forensic Medicine	MLFM 402	3	8	Compulsory				

2.3. Courses that changed from complusoray courses in bylaw 2012 to Elective courses in bylaw 2018

	First Cu	rriculum			Modified Curriculum								
Course Title	Course Code	Credi t Hour s	Teachi ng Level	Compulsory /Elective	Course Title	Course Code	Credit Hours	Teachi ng Level	Compulsor y/Elective				
Arabic Language	ARAB 101	3	1	Compulsory	Arabic Language	ARAB 101E	3	-	Elective				
Behavioral Psychology	HUMN 101	3	1	Compulsory	Behavioral Psychology	HUMN 101E	3		Elective				
General Physics	PHYS 101	3	1	Compulsory	General Physics (PHYS 101)	PHYS 101E	3		Elective				
Evolutionary and Population Genetics	EVPG 201	3	3	Compulsory	Evolutionary and Population Genetics	EVPG 207E	3		Elective				
Concepts and Issues in Biotechnology	BIOT 202	2	4	Compulsory	Concepts and Issues in Biotechnology	BIOT 202	2		Elective				
Comparative Biology	CBIL 202	2	4	Compulsory	Comparative Biology	CBIL 202E	2		Elective				
Applied Microbiology	APMC 301	3	5	Compulsory	Applied Microbiology	APMC 402E	3	~	Elective				
Biochemical Genetics	BCGN 202	3	4	Compulsory	Biochemical Genetics of Metabolic Diseases	BGMD 303E	3	EN	Elective				
Chemistry of Proteins and Enzymes	CHPE 202	3	4	Compulsory	Chemistry of Proteins and Enzymes	CHPE 306E	3	21	Elective				

2.4. Courses whose number of credit hours has been modified in bylaw 2018

	First Cu	rriculum			Modified Curriculum								
Course Title	Course Code	Credi t Hour s	Teachi ng Level	Compulsor y/Elective	Course Title	Course Code	Credit Hours	Teachi ng Level	Compulsor y/Elective				
Basics in Mathematics	MATH 101	3	1	Compulsory	Basics in Mathematics	MATH-101	2	1	Compulsory				
Biostatistics	STAT 102	3	2	Compulsory	Biostatistics	STAT-102	2	2	Compulsory				
Biotechnology Seminar	BTSM 402	3	8	Compulsory	Biotechnology Seminar	BTSM 402	2	8	Compulsory				
Commercial Biotechnology	CMBT 402	3	8	Compulsory	Commercial Biotechnology	CMBT 402	2	8	Compulsory				

2.5. Courses that has been combined in bylaw 2018

	First C	urriculum			Modified Curriculum								
Course Title	Course Code	Credit Hours	Teaching Level	Compulsory/E lective	Course Title	Course Code	Credit Hours	Teaching Level	Compulsory/E lective				
Bioethics	BETH 301	3	5	Compulsory	Bioethics and	BEBS 302	3	6	Compulsory				
Biosafety	BSAF 302	2	6	Compulsory	Biosafety	DED3 302	3	0					

2.6. New courses in bylaw 2018

	First C	urriculum			Modified Curriculum								
Course Title	Course Code	Credit Hours	Teachin g Level	Compulsory /Elective	Course Title	Course Code	Credit Hours	Teachin g Level	Compulsory /Elective				
-	-	-	-	-	Environmental Biotechnology	ENBT 401	3	7	Compulsory				

	First Cu	rriculum			Modified Curriculum							
Course Title	Course Code	Credit Hours	Teaching Level	Compulsory/ Elective	Course Title	Course Code	Credit Hours	Teaching Level	Compulsory/ Elective			
Biophysics	BPHY 201	3	3	Compulsory	Biophysics	BPHYS 101	3	1	Compulsory			
Cytogenetics	CYGN 201	3	3	Compulsory	Cytogenetics	CYGN 202	3	4	Compulsory			
Experimental Biochemistry	EXBC 202	3	4	Compulsory	Experimental Biochemistry	EXBC 201	3	3	Compulsory			
Molecular Genetics I	MLGN 301	3	5	Compulsory	Molecular Genetics I	MLGN 201	3	3	Compulsory			
Plant Tissue Culture	PLTC 301	3	5	Compulsory	Plant Tissue Culture	PLTC 201	3	3	Compulsory			
Process Biotechnology	PRBT 302	3	6	Compulsory	Process Biotechnolog v	PRBT 201	3	3	Compulsory			
Molecular Genetics II	MLGN 302	3	6	Compulsory	Molecular Genetics II	MLGN 202	3	4	Compulsory			
Animal Microtechnique and Tissue Culture	AMTC 302	3	6	Compulsory	Animal Microtechniqu e and Tissue Culture	ANTC 202	3	4	Compulsory			
Genetic Engineering I	GNEG 401	3	7	Compulsory	Genetic Engineering I	GENG 301	3	5	Compulsory			
Genetic Engineering II	GNEG 402	3	8	Compulsory	Genetic Engineering II	GENG 302	3	6	Compulsory			

2.7. Courses for which the academic level has been modified



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