DESCRIPTION OF ACADEMIC PROGRAM

BIOLOGY DEPARTMENT

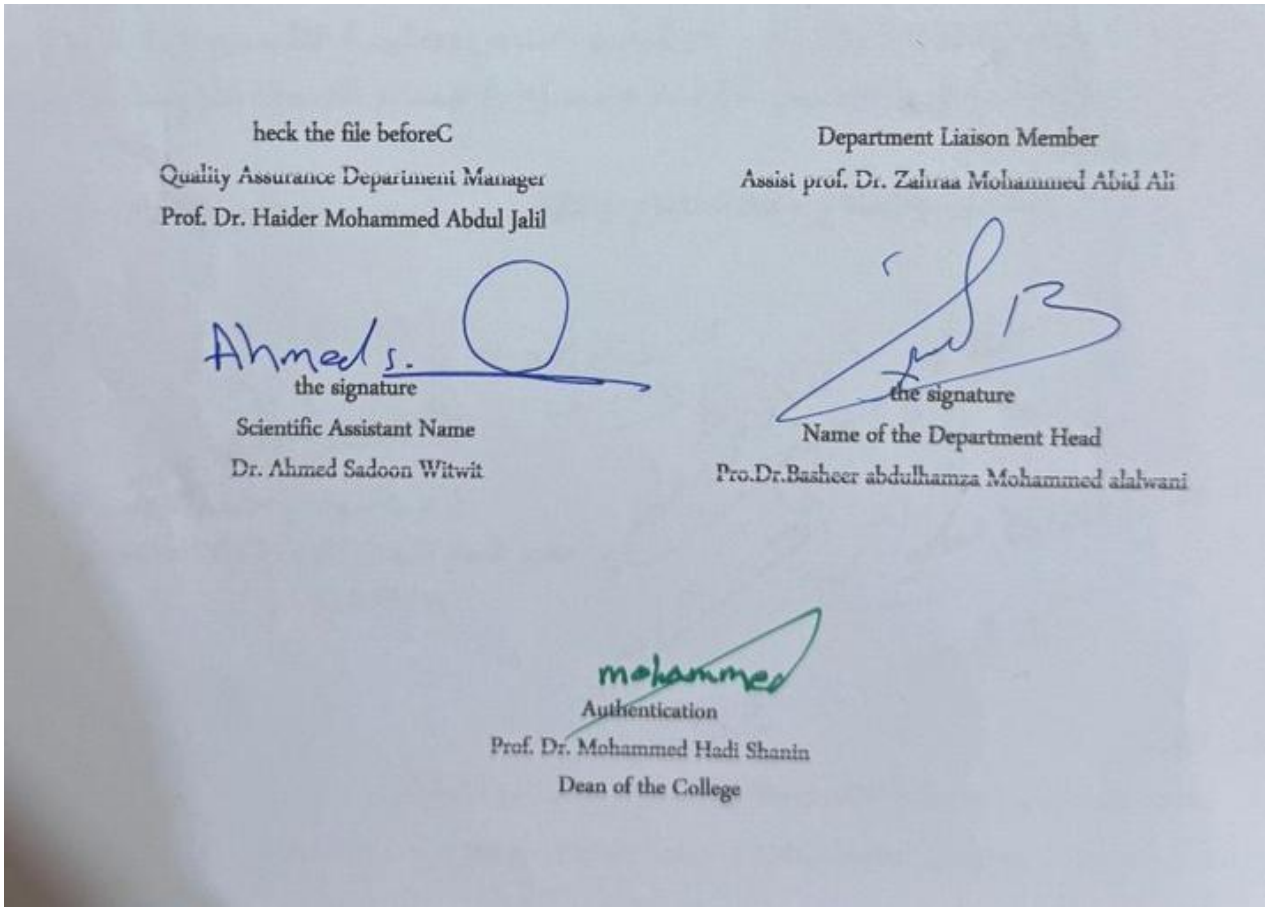
COLLAGE OF SCIENCE

وصف البرنامج الاكاديمى

كلية العلوم / قسم علوم الحياة

اعداد لجنة الجودة فى القسم

University name	University of Babylon
College/Institute	College of Science
Scientific Department	Department of Biology
Name of academic or professional program	Biology
Final Certificate Name	B.Sc. of Biology
The educational system	The first and second stages of the Bologna route Stage 3 and 4 courses
preparation date Description	2024-9-4
Date of filling out the file	2025-1 -4



Introduction

The Department of Biology within the College of Science is one of the core academic units dedicated to preparing highly qualified professionals capable of keeping pace with contemporary scientific advancements across diverse fields of biology. The academic program is designed to provide students with a solid foundation in both general and specialized biological sciences, integrating theoretical coursework with hands-on laboratory training.

The department aims to graduate students who possess strong analytical and research skills, enabling them to explore and interpret biological phenomena at multiple levels—from molecules and cells to organisms and ecosystems. Emphasis is also placed on fostering critical thinking, problem-solving abilities, and the application of modern techniques in biological analysis and diagnostics.

In addition to its educational mission, the department places great importance on both basic and applied scientific research, addressing pressing environmental, health, and agricultural challenges facing the country. It also promotes collaborative partnerships with local, regional, and international research centers to ensure alignment with global scientific developments and to strengthen academic outcomes.

Thus, the Biology Department's program serves as a cornerstone for preparing future generations of graduates qualified to contribute effectively in education, research institutions, and sectors related to health, environment, and agriculture—ultimately supporting sustainable development and enhancing the university's role within the scientific community.

1. Program vision
Preparing a conscious and innovative generation with a deep understanding of life and living organisms, contributing to the advancement of biological sciences in addressing environmental, health, and life challenges

2. Program message
Offering comprehensive academic and research programs in the life sciences that foster a profound understanding of biological processes, enhance research and analytical skills, and prepare students for both the job market and advanced academic pursuits, while upholding ethical values and environmental responsibility

3. Program objectives

- **Provide students with advanced knowledge** across the major branches of life sciences, including cell biology, genetics, molecular biology, physiology, ecology, zoology, botany, and related disciplines.

- **Develop research competencies** through hands-on laboratory training and active participation in scientific research projects.

- **Enhance analytical and problem-solving skills** by applying recognized scientific methodologies.

- **Integrate modern technologies** into education and research, such as electron microscopy, molecular biology techniques, bioinformatics, and genetic engineering tools.

- **Prepare students for professional careers** in education, healthcare, agriculture, pharmaceutical industries, and research institutions.

- **Promote innovation and scientific entrepreneurship** in the fields of applied life sciences.

- **Instill ethical and professional values** in research practices and in dealing with living organisms and biotechnological applications.

- **Support environmental sustainability and biodiversity** by linking education and research to pressing environmental and societal issues

4. Program accreditation
The request has been formally submitted

5. Other external influences
• **Security, political, and economic conditions** • **University infrastructure and support services** • **Environmental, health, social, and cultural influences** • **Global technological impacts** • **International and research collaborations**

6. **Program structure**				
Program structure	Number of courses	Study unit	percentage	* comments
Institutional requirements	4	8	15.2%	
College requirements	3	8	12.31%	
Department requirements	47	180	75.65%	
Summer training	There is			
Other				
*This can include notes whether the course is basic or optional				

7 Description Program -				
Year/Level	**Course name**	**Course code**	**Credit hours**	
			theoretical	**practical**
The first stage				
Bologna system				

Year/Level	**Course name**	**Course code**	**Credit hours**	
			theoretical	**practical**
The second stage				
Bologna system				

Year/Level	Course name	Course code	Credit hours	
			theoretical	practical
Stage 3				
Microbiology Department				
First course	Animal Histology	AHM30028(2+1)	**2**	**2**
	Environment	ENM3029(2+1)	**2**	**2**
	Cell biology	CBM3030(2+1)	**2**	**2**
	Soil Microbiology	SMM3031(2+1)	**2**	**2**
	Protozoa	PRM3032(2+1)	**2**	**2**
	Immunology	IMM3033(2+1)	**2**	**2**
Second course	Animal physiology	APM3034(2+1)	**2**	**2**
	Ecological Pollution	EPM3035(2+1)	**2**	**2**
	General Genetics	GGM3036(2+1)	**2**	**2**
	Sewage Microbiology	SMM3037(2+1)	**2**	**2**
	Plant Physiology	PPM3038(2+1)	**2**	**2**
	Microbial physiology	MPM3039(2+1)	**2**	**2**
Total hours			**hours 24**	**hours 24**
Biotechnology Branch				
First course	Medical Plant	MEP3040(2+1)	**2**	**2**
	Cell biology	CBT3041(2+1)	**2**	**2**
	General Genetics	GGT3042(2+1)	**2**	**2**
	Environment	ENT3043(2+1)	**2**	**2**
	Principles Biotechnology	PBT3044(2+1)	**2**	**2**
	Secondary Metabolite	SMT3045(2+1)	**2**	**2**
Second course	Animal tissues	ATT3046(2+1)	**2**	**2**
	Molecular Biology	MBT3047(2+1)	**2**	**2**
	Medical Genetics	MGT3048(2+1)	**2**	**2**
	Ecological Pollution	EPT3049(2+1)	**2**	**2**
	Pathogenic Bacteria	PBT3050(2+1)	**2**	**2**
	Microbial Ecology	MET3051(2+1)	**2**	**2**
Total hours			**hours 24**	**hours 24**
General Biology Branch				
First course	Animal tissues	ATG3052(2+1)	**2**	**2**
	Environment	ENG3053(2+1)	**2**	**2**
	Cell biology	CBG3054(2+1)	**2**	**2**

	Plant Physiology	PPG3055(2+1)	**2**	**2**
	Fungi	FUG3056(2+1)	**2**	**2**
	Endocrinology	ENG3061(2+1)	**2**	**2**
Second course	Animal physiology	APG3058(2+1)	**2**	**2**
	PollutionEcological	PEG3059(2+1)	**2**	**2**
	General Genetics	GGG3060(2+1)	**2**	**2**
	Molecular Biology	MBG3057(2+1)	**2**	**2**
	PathologyPlant	PPG3062(2+1)	**2**	**2**
	Protozoa	PRG3063(2+1)	**2**	**2**
Total hours			**hours 24**	**hours 24**
Branch Ecology and Pollution				
First course	Animal tissues	ATE3064(2+1)	**2**	**2**
	Animal Ecology	AEE3065(2+1)	**2**	**2**
	Cell biology	CBE3066(2+1)	**2**	**2**
	Fresh water biology	FWE3067(2+1)	**2**	**2**
	Microbial Ecology	MEE3068(2+1)	**2**	**2**
	Bioradiation	BRE3069(2+1)	**2**	**2**
Second course	Animal physiology	APE3070(2+1)	**2**	**2**
	Plant Ecology	PEE3071(2+1)	**2**	**2**
	General Genetics	GGE3072(2+1)	**2**	**2**
	Plant ecophysiology	PEE3073(2+1)	**2**	**2**
	Ecosystems	ECE3074(3+0)	**2**	-
	Molecular Biology	MBE3075(2+1)	**2**	**2**
	Air pollution	EME3076(2+0)	**2**	-
Total hours			**hours 26**	**hours 22**

Year/Level	**Course name**	**Course code**	**Credit hours**	
			theoretical	**practical**
Stage Four				
Microbiology Department				
First course	Fungi	FUM4077(2+1)	**2**	**2**
	Food Microbiology	FMF4078(2+1)	**2**	**2**
	Pathogenic Bacteria	PBM4079(2+1)	**2**	**2**
	Molecular Biology	MBM4080(2+1)	**2**	**2**
	Antibiotics	ANM4081(2+1)	**2**	**2**
	Pathological Analysis	PAM4082(2+1)	**2**	**2**
Second course	Microbiology Taxonomy	MIT 4084(2+1)	**2**	**2**

	Industrial Microbiology	IMM4085(2+1)	**2**	**2**
	Virology	VIM4086(2+1)	**2**	**2**
	microbial genetic	MGM4087(2+1)	**2**	**2**
	Biotechnology and Genetic Engineering	BGM4088(2+1)	**2**	**2**
	Microbial Ecology	MEE3068(2+1)	**2**	**2**
	Research Project 2	RPM4090(0+1)	-	**2**
Number of hours			**hours 24**	**hours 26**
Biotechnology Branch				
Biotechnology	Fermentation technique 1	FTT4091(2+1)	**2**	**2**
	Plant Physiology	PPT4092(2+1)	**2**	**2**
	Genetic engineering 1	GET4093(2+1)	**2**	**2**
	Virology	VIT4094(2+1)	**2**	**2**
	Microbial toxin	MTT4095(2+1)	**2**	**2**
	Pathological Analysis	PAT4096(2+1)	**2**	**2**
Second course	Fermentation technique 2	FTT4091(2+1)	**2**	**2**
	Animal Physiology	APT4099(2+1)	**2**	**2**
	Genetic engineering 2	GET4100(2+1)	**2**	**2**
	Immunology	IMT4101(2+1)	**2**	**2**
	Fungi	FUT4102(2+1)	**2**	**2**
	Plant biochemistry	PBT4103(2+1)	**2**	**2**
	Research Project 2	RPT4104(0+1)	-	**2**
Total hours			**hours 24**	**hours 26**
Branch General Biology				
First course	Chordate	CHG4105(2+1)	**2**	**2**
	Plant growth and development 1	PGDG4106(2+1)	**2**	**2**
	Embryology	EMG4107(2+1)	**2**	**2**
	Biotechnology and Genetic engineering	BGE4108(2+1)	**2**	**2**
	Animal Behavior	ANB4109(2+1)	**2**	**2**
	plant Ecophysiology	PEG4110(2+1)	**2**	**2**
	Comparative Anatomy	CAG4112(2+1)	**2**	**2**
	Plant growth and development 2	PGDG4113(2+1)	**2**	**2**

	Immunology	IMG4114(2+1)	**2**	**2**
	Plant Nutrition	PNG4115(2+1)	**2**	**2**
	Plant Tissue culture	TCG4116(2+1)	**2**	**2**
	Pathological Analysis	PAG4117(2+1)	**2**	**2**
	Research Project2	RPG4118(0+1)	-	**2**
Total hours			**hours 24**	**hours 26**
Branch Ecology and pollution				
First course	Water pollution	wap4119(2+1)	**2**	**2**
	Fungi environmental	FUE4120(2+1)	**2**	**2**
	Biodiversity	BIE4121(2+1)	**2**	**2**
	Eco-hydrology	E4132(2+1)	**2**	**2**
	Immunology	IME4123(2+1)	**2**	**2**
	Soil pollution	sapE4125(2+1)	**2**	**2**
Second course	Ecological treatment	ETE4126(2+1)	**2**	**2**
	Environmental Biotechnology	EBE4127(2+1)	**2**	**2**
	Fish Ecology	FEE4128(2+1)	**2**	**2**
	Zooplankton	ZPE4129(2+1)	**2**	**2**
	Pathological Analysis	PAE4130(2+1)	**2**	**2**
	Phytoplankton	PHE4122(2+1)	**2**	**2**
	Research Project 2	RPE4131(0+1)	-	**2**
Total hours			**hours 24**	**hours 26**

8Expected learning outcomes of the program

knowledge	
Knowledge and -A understanding	**A1.** Students recognize the historical development of life sciences across different fields. **A2.** Students categorize the specific requirements for each laboratory analysis. **A3.** Students identify and describe the tools and instruments required for each type of analysis. **A4.** Students are able to analyze and interpret the results of laboratory examination techniques
Skills	
specific -Subject -b skills	**B1.** Students recognize the interrelationship between life sciences and other scientific disciplines. **B2.** Students are able to identify biological activities and their connections with different organisms. **B3.** Students are able to evaluate results using various statistical tests. **B4.** Students gain the ability to identify and interpret different types of relationships among living organisms

Thinking skills -C	**C1.** Development of thinking skills according to the student's individual ability. **C2.** Advanced thinking skills, enabling students to engage in careful and deliberate decision-making. **C3.** Critical thinking skills applied within the educational context. **C4.** Reasoned and logical thinking skills

9. Teaching and learning strategies

1- **Thinking strategy based on the student's ability:**
Example: If a student can grasp the correct concept of system analysis, they develop skills in managing and organizing their personal life.

2- **High-level thinking skills strategy:**
Example: When a student aims to make a sound decision, it is essential to think carefully before acting. Making a decision without proper reasoning, or being unable to think critically, indicates a lack of high-level thinking skills.

3- **Critical thinking strategy in learning:**
Critical thinking represents the highest levels of cognitive processing, where a problem is presented, analyzed logically, and a solution is reached through reasoned evaluation.

4- **Brainstorming:**
A strategy used to generate multiple ideas or solutions collaboratively, encouraging creativity and diverse perspectives

10. Evaluation methods

1- Exams (daily and monthly exams)
2- Reports
3- Projects Design
4- Feedback Learning

E-Learning using Moodle

11-Faculty Members

No.	Name	Degree	Academic Tittel	Subspeciality
1	Basheer abdul hamza mohammed alalwani	.Ph.D	professor	Plant physiology and tissue culture
3	Haider Kamil Zaidan Al Saadi	.Ph.D	professor	Physiology
4	Ali Hmood	.Ph.D	professor	Genetic engineering
5	Alaa Jawad Hassan	.Ph.D	professor	Immunity
6	Azhar Omran Althahab	.Ph.D	professor	Microbiology
7	Eman Mohammad Jarallah	.Ph.D	professor	Industrial Microbiology
9	Jasim Mohammed Salman	.Ph.D	professor	Ecology & Pollution

10	Mohammed abdullah jebor	.Ph.D	professor	Biotechnology/ Enzymology
11	Rabab Omran Radhi Al-Jelawi	.Ph.D	professor	Genetic engineering
12	Ibtihal Muiz Abdul Mahdi Al-Hussaini	.Ph.D	professor	Mycology
14	Moayed Jassim yass	.Ph.D	professor	Animal ecology
15	Frial Jamel Abid	.Ph.D	professor	Immunity
16	Amel Ali Muheisen	.Ph.D	professor	Embryology
17	Shakir H.Mohammed Al.Alwany	.Ph.D	professor	Virology
18	Wejdan ridha tajaldeen	.Ph.D	professor	Microbiology
19	Rihab Edan Kadhim	.Ph.D	professor	Plant Cell Physiology
20	Ayad M.J.Al-Mamoori	.Ph.D	professor	Environmental Biotechnology
21	Anwar kadhim hussein AL-SAFFAR	.Ph.D	professor	Microbiology
22	Nidaa Adnan Abu-Serag	.Ph.D	professor	plant taxonomy
23	Maysaa Adil Hadi	.Ph.D	professor	Molecular cell biology
24	Jenan Mahdi Jawad Kadhim Al-kawaz	ماجستير	professor	Histology
25	Nuha Yarub Mohammed	.Ph.D	professor	Reproductive physiology
26	Evan Ibrahim Merhij	.Ph.D	professor	Botany
27	Kassim Abdulla Hamza Al-Morshidy	.Ph.D	professor	Parasite immunity
28	Alaa Tareq Shakir	.Ph.D	professor	Parasite immunity
29	Mourouge Saadi Abbas Alwash	.Ph.D	professor	Microbiology / Antibiotic
30	Hussaien Allewi Mutlib	.Ph.D	professor	Molecular Biology
31	Batool Mohammed Hassan Al Adily	.Ph.D	professor	Ecology
32	Shaimaa Jassim Mohemeed Asultany	.Ph.D	professor	Microbiology
33	Thikra Abid al-Ally	Master	professor	Biotechnology
34	Anwar Ali Abdulla Alhussainy	.Ph.D	professor	Biotechnology and genetic engineering
35	Farah Tarik Abid Al-Rida	Master	professor	Microbiology
36	Zeena Hadi Obaid Alwan	Ph.D.	professor	Molecular Biology and Biotechnology
37	Nuha Falih Kadhim	.Ph.D	professor	Environmental treatments
38	Noor Salman kadhim	.Ph.D	professor	Microbiology
39	Adi Jassim Abid Al-Razaq	.Ph.D	professor	Ecology -Biodiversity
40	Suad ghali kadhim Alahmed	Master	assistant professor	Environmental treatments
41	Walaa Salih Hassan	.Ph.D	professor	Hematology
42	Jenan Mohammed ubaid	Master	assistant professor	Entomology

44	Fadia Hameed Mohammed	.Ph.D	professor	Medicinal plants
45	Shaimaa Abd AL-Hadi	Master	assistant professor	Zoology
46	Mona Najah Hassan	.Ph.D	professor	Biotechnology
47	Yazi Abdullah Jassim	.Ph.D	professor	Microbiology
48	Sura Ihsan Abed Jabuk	.Ph.D	professor	Microbiology
49	Hala Mohi Naji	.Ph.D	professor	Zoology
50	Shaemaa Muhi Hasson AL-Amery	.Ph.D	professor	Plant Taxonomy and Anatomy
51	Bassam M. Al-Yaseen	.Ph.D	assistant professor	Ecology
52	Wameedh Adil Kadhim	.Ph.D	professor	Ecology -Biodiversity
53	Zahraa Mohammed Abd Ali AL-Taee	.Ph.D	assistant professor	Biotechnology
54	Raflaa sabek hussien	.Ph.D	assistant professor	Comparative anatomy
55	Wathiq Jassim Mohammed	.Ph.D	assistant professor	Ecology
56	Hala Abd Al-Hadi	.Ph.D	assistant professor	Zoology
57	Liqaa Yehya Mohsen	.Ph.D	assistant professor	Microbiology
58	Nihad Kadhim	Master	Lecturer	Biotechnology
59	Hanan Ahmed Hadi	.Ph.D	Lecturer	Medical plants
60	Iman Fadhil Abass	Master	Lecturer	Zoology
61	Mohammed Hussaien	Master	Lecturer	Microbiology
62	Hassanein Qassam Zeidan	.Ph.D	assistant professor	Mathematics
63	Dalia Salah	Master	Lecturer	Biotechnology
64	Shaima Obais	Master	Lecturer	Ecology
65	Rafal Ahmed Lilo	Master	assistant professor	Biotechnology
66	Rasha Kadhim Mahdi	Master	assistant professor	Zoology
67	Hawraa Mohammed Ridha	Master	Lecturer	Microbiology
68	Dalal Mohammed Ridha	Master	Lecturer	Microbiology
69	Ali Nasir Hussein	Master	assistant Lecturer	Mycology
70	Noor Mahmood Naji	Master	Lecturer	Plant anatomy
71	Zahraa Ali Abdullah	Master	Lecturer	Microbiology
72	Zanaib Hammed	Master	assistant Lecturer	Microbiology
73	Halla Faze Abid AL-Hadi	Master	Lecturer	Ecology and pollution
74	Noor Saadallah Naji	Master	Lecturer	Microbiology Ecology
75	Yusra Abdulhamza Radeef	Master	Lecturer	Biotechnology
76	Anmar Mahdi Kadhim AL-Maamori	Master	Lecturer	Microbiology
77	Zahraa Abid Nemaa	Master	assistant Lecturer	Plant phisyology
78	Farah Mumtaz	.Ph.D	Lecturer	Cell biology
79	Omnia abdul Nasser	.Ph.D	Lecturer	Microbiology

80	Eman Mobder Nayif	.Ph.D	assistant professor	Microbiology
81	YASIR SALAM KARIM	Master	assistant Lecturer	Zoology
82	Iman Kareem kadhim	Master	assistant Lecturer	Zoology
83	Hiba Haded Rashid	.Ph.D	assistant Lecturer	Mycology
83	Noor Rahi Jassim	Master	assistant Lecturer	Zoology
85	Mays Mohammed Weber Alzuhery	Master	assistant Lecturer	Ecology
86	Tabarak fakhri hashim	Master	assistant Lecturer	Biotechnology
87	Hanna Abdulkareem hussein	.Ph.D	assistant Lecturer	Zoology
88	Nawres Abdulkareem Hussein	Master	assistant Lecturer	Ecology
89	Hadi Sajid	.Ph.D	Lecturer	Biotechnology
90	Autaf Talal Shaker	.Ph.D	assistant Lecturer	and genetic Biotechnology engineering
91	Essam Murad	Master	assistant Lecturer	Biotechnology
92	Noor Muhsen Jawad	Master	assistant Lecturer	Zoology
93	Safaa Abbass Abd Al-kahdum	Master	assistant Lecturer	Microbiology
94	Roaa Ameen Rahomi Al-Samak	Master	assistant Lecturer	Zoology
95	Fatima Hasson	Master	assistant Lecturer	Ecology
96	Ali Shakir Obaid	Master	assistant Lecturer	Biotechnology
97	Ali Rahman Shakir	Master	assistant Lecturer	Botany
98	Noor Abbas Jawad	Master	assistant Lecturer	Microbiology
99	Maryam Ayad Gabbar	Master	assistant Lecturer	Network technology
100	Shahad fadhil hashim	Master	assistant Lecturer	Microbiology

12- Professional development

Orientation of new faculty members

- **Academic orientation for new faculty members and its impact on improving university performance.**
- **Identifying the academic and administrative guidance needs of new faculty members in higher education institutions.**
- **Developing a proposal for a comprehensive orientation program for new faculty members in line with global academic quality standards.**
- **The role of orientation programs in enhancing institutional affiliation and motivation among new faculty members**

Professional development for faculty members

training programs to develop teaching skills among faculty-E• **E-learning programs for**

enhancing the teaching skills of faculty members.

- **Workshops aimed at improving faculty performance in light of the requirements of digital higher education.**
- **Enhancing active teaching strategies for faculty members.**
- **Professional development programs and their role in increasing the research productivity of faculty members.**
- **Designing a professional development program based on action research to improve academic performance.**
- **The relationship between professional development and scientific publishing skills in peer-reviewed journals**

13- Acceptance criteria
Central Admission

14- The most important sources of information about programs
1- Textbooks 2- :Internet sources include أ- books-e ب- Scientific research

Program Development Plan
1- %20-Annual update of curricula by no more than 15 2- separating, limiting or adding courses in line with scientific development and ,Merging the labor market

Program Skills Map

Required learning outcomes of the program

thinking skills	specific skills-Subject	knowledge and	Essential	Course	Course	stage

								understanding				or optional ?	name	code	
A4	Part 3	Part 2	Part 1	B4	B3	B2	B1	A4	A3	A2	A1				
Within the Bologna Process															**The first stage**
Within the Bologna Process															**The second stage**

stage	Course code	Course name	Essential or optional ?	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
Microbiology branch -Third stage	UOBAB0501051	Soil microbiology	essential	*	*				*				*		*
	UOBAB0501052	immunity	essential	*		*				*		*			
	UOBAB0501053	animal tissues	essential		*		*		*				*		*
	UOBAB0501054	Foundations of Environmental Science	essential		*	*			*	*		*			
	UOBAB0501055	molecular biology	optional		*			*		*				*	
		antibiotics		*			*		*						
	UOBAB0501056	mushrooms	optional	*		*				*			*		
		Plant physiology		*	*			*			*				*
	UOBAB0501061	Animal physiology	essential	*	*				*				*		*
	UOBAB0501062	environmental pollution	essential	*		*				*		*			
	UOBAB0501063	Physiology of microscopi	essential		*		*		*				*		*

		c organisms													
	UOBAB0501064	Microbiology of water and sewage	**essential**		*	*			*	*		*			
	UOBAB0501065	medicinal plants	**essential**												
	UOBAB0501066	Microbial vaccines	**essential**												

stage	Course code	Course name	Essential or optional ?	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
Third stage/ Biotechnology branch	**UOBAB0501051**	molecular biology	**essential**	*	*				*				*		*
	UOBAB0501052	Foundations of biotechnology	**essential**	*		*				*		*			
	UOBAB0501053	Plant physiology	**essential**		*		*		*				*		*
	UOBAB0501054	Foundations of Environmental Science	**essential**		*	*			*	*		*			
	UOBAB0501055	Cell biology	**optional**		*			*		*				*	
		Endocrine glands		*			*		*						
	UOBAB0501056	Viruses	**option**	*		*				*			*		

		Biosensor technologies	**al**	*	*			*			*					*
	UOBAB0501061	animal tissues	**essential**	*	*				*					*		*
	UOBAB0501062	environmental pollution	**essential**	*		*					*		*			
	UOBAB0501063	Secondary metabolism products	**essential**		*		*		*					*		*
	UOBAB0501064	Molecular diagnostic techniques	**essential**		*	*			*	*		*				
	UOBAB0501065	Gene therapy	**optional**		*			*		*					*	
		Biological evidence		*	*				*					*		*
	UOBAB0501066	Immunology and Vaccine Technology	**optional**	*		*					*		*			
		plant tissue culture			*		*		*					*		*

stage	Course code	Course name	Essential or optional ?	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
- General Biol	**UOBAB0501051**	animal tissues	**essential**	*	*				*				*		*

	UOBAB0501054	mushrooms	essential	*		*				*		*			
	UOBAB0501053	Plant physiology	essential		*		*		*				*		*
	UOBAB0501054	Foundations of Environmental Science	essential		*	*			*	*		*			
	UOBAB0501055	medicinal plants	optional		*			*		*				*	
		Archikons		*			*		*						
	UOBAB0501056	antibiotics	optional	*		*				*			*		
		molecular biology		*	*			*			*				*
	UOBAB0501061	Animal physiology	essential	*	*				*				*		*
	UOBAB0501062	environmental pollution	essential	*		*				*		*			
	UOBAB0501063	Comparative anatomy	essential		*		*		*				*		*
	UOBAB0501064	-plant based nutrition	essential		*	*			*	*		*			
	UOBAB0501065	Microbial vaccines	optional		*			*		*				*	
		Molecular diagnostic techniques		*	*				*				*		*
	UOBAB050106	Elementar	option	*		*				*		*			

	6	y	al												
		animal behavior			*		*		*				*		*

stage	Course code	Course name	Essential or optional ?	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
Environment and Environmental Pollution Branch -Stage Three	UOBAB0501051	plant environment	essential	*	*				*				*		*
	UOBAB0501052	freshwater biology	essential	*		*				*		*			
	UOBAB0501053	Environmental biotechnology	essential		*		*		*				*		*
	UOBAB0501054	General inheritance	essential		*	*			*	*		*			
	UOBAB0501055	Microbial environment	optional		*			*		*				*	
		Plant environmental physiology		*			*		*						
	UOBAB0501056	animal tissues	optional	*		*				*			*		
		molecular biology		*	*			*			*				*
	UOBAB0501061	Animal physiology	essential	*	*				*				*		*

	UOBAB0501062	animal environment	essential	*		*				*		*			
	UOBAB0501063	aquatic environment	essential		*		*		*				*		*
	UOBAB0501064	Diversify my life	essential		*	*			*	*		*			
	UOBAB0501065	Fertilizers	optional		*			*		*				*	
		microbial contamination		*	*				*				*		*
	UOBAB0501066	Plant physiology	optional	*		*				*		*			
		environmental toxins			*		*		*				*		*

stage	Course code	Course name	Essential or option ?al	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
Stage \Four Microbiology Branch	UOBAB0501071	Microbial bioinformatics	essential	*	*				*				*		*
	UOBAB0501072	Food microbiology	essential	*		*				*		*			
	UOBAB0501073	pathogenic microorganisms	essential		*		*		*				*		*
	UOBAB0501074	Biotechnology	essential		*	*			*	*		*			

	UOBAB0501075	Classification of microscopic organisms	essential		*			*		*				*	
	UOBAB0501076	Hormonal applications	optional	*			*		*						
		Microbial environment		*		*				*			*		
		primitive animals		*	*			*			*				*
	UOBAB0501081	Microbial genetics	essential	*	*				*				*		*
	UOBAB0501082	artificial microorganisms	essential	*		*				*		*			
	UOBAB0501083	Viruses	essential		*		*		*				*		*
	UOBAB0501084	genetic engineering	essential		*	*			*	*		*			
	UOBAB0501085	Graduation project	essential		*			*		*				*	
	UOBAB0501086	Pathological analyses	optional	*	*				*				*		*
		mycotoxins		*		*				*		*			
		Diversify my life			*		*		*				*		*

stage	Course code	Course name	Essential or optional ?	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
Biotechnology branch -Fourth stage	UOBAB0501071	Fermentation techniques	essential	*	*				*				*		*
	UOBAB0501072	human genetics	essential	*		*				*		*			
	UOBAB0501073	Genetic engineering1	essential		*		*		*				*		*
	UOBAB0501074	pathogenic microorganisms	essential		*	*			*	*		*			
	UOBAB0501075	-Bio separation basics	essential		*			*		*				*	
	UOBAB0501076	mushrooms	optional	*			*		*						
		Environmental biotechnology		*		*				*			*		
		Pathological analyses		*	*			*			*				*
	UOBAB0501081	Fundamentals of Enzymology	essential	*	*				*				*		*
	UOBAB0501082	Classificati	essential	*		*				*		*			

		on of microscopic organisms													
	UOBAB0501083	engineering 2	essential		*		*		*				*		*
	UOBAB0501084	Bioinformatics Fundamentals	essential		*	*			*	*		*			
	UOBAB0501085	Graduation project	essential		*			*		*				*	
	UOBAB0501086	heredity	optional	*	*				*				*		*
		-plant based nutrition		*		*				*		*			
		Diversify my life			*		*		*				*		*

stage	Course code	Course name	Essential or optional?	knowledge and understanding				specific skills-Subject				thinking skills			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4
Fourth stage_General Biology Branch	UOBAB0501071	plant tissue culture	essential	*	*				*				*		*
	UOBAB0501072	embryology	essential	*		*				*		*			
	UOBAB0501073	plant environment	essential		*		*		*				*		*
	UOBAB0501074	Plant diseases	essential		*	*			*	*		*			
	UOBAB0501075	Chordata	essent		*			*		*				*	

			ial												
	UOBAB0501076	Plant growth and developmen t1	**optio nal**	*			*		*						
		pathogenic microorgani sms		*		*				*			*		
		Biotechnol ogy		*	*			*			*				*
	UOBAB0501081	Immunology	**essent ial**	*	*				*				*		*
	UOBAB0501082	Plant environmen tal physiology	**essent ial**	*		*				*		*			
	UOBAB0501083	Classificatio n of microscopic organisms	**essent ial**		*		*		*				*		*
	UOBAB0501084	genetic engineering	**essent ial**		*	*			*	*		*			
	UOBAB0501085	Graduation project	**essent ial**		*			*		*				*	
	UOBAB0501086	Pathological analyses	**optio nal**	*	*				*				*		*
		Endocrine glands		*		*				*		*			

stage	**Course code**	**Course name**	**Essenti al or optiona ?l**	**knowledge and understanding**				**specific skills-Subject**				**thinking skills**			
				A1	A2	A3	A4	B1	B2	B3	B4	Part 1	Part 2	Part 3	A4

Four Stage - Environment and Environmental Pollution Branch	**UOBAB0501071**	water pollution	essential	*	*				*				*		*
	UOBAB0501072	pathogenic microorganisms	essential	*		*				*		*			
	UOBAB0501073	Fish environment	essential		*		*		*				*		*
	UOBAB0501074	phytoplankton	essential		*	*			*	*		*			
	UOBAB0501075	ecosystems	essential		*			*		*				*	
	UOBAB0501076	immunity	optional	*			*		*						
		Archikons		*		*				*			*		
		Biotechnology		*	*			*			*				*
	UOBAB0501081	Environmental treatments	**essential**	*	*				*				*		*
	UOBAB0501082	soil pollution	**essential**	*		*				*		*			
	UOBAB0501083	Classification of microscopic organisms	**essential**		*		*		*				*		*
	UOBAB0501084	zooplankton	**essential**		*	*			*	*		*			
	UOBAB0501085	Graduation project	**essential**		*			*		*				*	

	UOBAB0501086	Pathological analyses	optional	*			*		*							
		Fungal environment		*		*				*			*			
		genetic engineering		*	*			*			*					*