Department of Environmental Biotechnology

Environmental Doctorate Index

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Academic Reference Standards for Doctorate Postgraduate Studies of Environmental Biotechnology

Academic Reference Standards (ARS) for Doctorate Postgraduate Studies, NAQAAE, March 2009

1-The graduate of Doctorate program of any specialty must be able to:

1.1. Master basics and methodologies of scientific research.

1.2. Add to the knowledge in the specialization field.

1.3. Apply analytical and critical approach to the knowledge in specialty and related areas.

1.4. Integrate specialized knowledge with relevant knowledge by extrapolating and developing relations between the two interfaces

1.5. Show in depth awareness of recent theories and ongoing problems in the specialization field.

1.6. Identify professional problems and find innovative solutions.

1.7. Master a wide range of professional skills in the specialty area.

1.8. Work towards the development of new methods, tools and procedures in professional practice.

1.9. Use appropriate technological means to serve his/her professional practice.

1.10. Communicate effectively and lead team-work in different professional contexts.

1.11. Make decisions according to available information.

1.12. Employ available resources efficiently and work to find and develop new resources.

1.13. Show awareness of his/her role in community development and environmental conservation.

1.14. Reflect the commitment to integrity and credibility of the profession and its rules

1.15. Commit him/her self to continuous self-development and to transfer knowledge and experience to others

2- General academic standards:

2.1. Knowledge & Understanding:

By the end of Doctorate program of any specialty, the graduate must have deep knowledge & understanding of:

2.1.1. Basic facts, theories and recent advances of the specialty and related subjects.

2.1.2. Basics, methodologies and scientific research ethics as its different tools.

2.1.3. Ethical and legal principles of professional practice.

2.1.4. Quality standards of professional practice.

2.1.5. Knowledge related to the professional practice impact on the environment development and conservation.

2.2. Intellectual skills:

By the end of the Doctorate program study in any specialty, the graduate must be able to:

2.2.1. Analyze, evaluate and deduce the information in the specialty fields.

2.2.2. Solve the specialized problems according to available data.

2.2.3. Conduct research studies that add to specialty knowledge.

2.2.4. Write and publish scientific articles.

2.2.5 Evaluate professional practice risks.

2.2.6. Plan to improve specialty performance.

2.2.7. Take decisions in various professional situations including dilemmas and controversial issues.

2.2.8. Add to the specialty field through creativity & innovation.

2.2.9. Manage discussions on basis of evidence and proofs.

2.3. Professional skills:

By the end of Doctorate program study in any specialty, the graduate must:

2.3.1. Master basic and advanced professional skills in the specialty field.

2.3.2. Write and appraise professional reports.

2.3.3. Evaluate and improve methods and tools used in the specialty.

2.3.4. Use technological tools to serve professional practice.

2.3.5. Plan for professional practice development and performance of others.

2.4. General & transferable skills:

By the end of the study of Doctorate program of any specialty, the graduate must:

2.4.1. Communicate effectively using different means.

2.4.2. Use information technology to improve professional practice.

2.4.3. Teach and evaluate others.

2.4.4. Perform self appraisal and seek continuous learning.

2.4.5. Use different resources to obtain information and knowledge.

2.4.6. Work in and lead a team.

2.4.7. Manage scientific meetings and time.

1. Program Graduate Attributes

The graduate of the program must be able to:

1.1. Master basics and methodologies of scientific research in the field of environmental biotechnology.

1.2. Add to the knowledge in the field of environmental biotechnology.

1.3. Apply analytical and critical approach to the knowledge in specialty and related areas.

1.4. Integrate specialized knowledge with relevant knowledge by extrapolating and developing relations between the two interfaces

1.5. Show in depth awareness of recent theories and ongoing problems in the field of environmental biotechnology.

1.6. Identify professional problems and find innovative solutions.

1.7. Master a wide range of professional skills in the specialty area.

1.8. Work towards the development of new methods, tools and procedures in professional practice.

1.9. Use appropriate technological means to serve his/her professional practice.

1.10. Communicate effectively and lead team-work in different professional contexts.

1.11. Make decisions according to available information.

1.12. Employ available resources efficiently and work to find and develop new resources.

1.13. Show awareness of his/her role in community development and environmental conservation.

1.14.Reflect the commitment to integrity and credibility of the profession and its rules

1.15.Commit him/her self to continuous self-development and to transfer knowledge and experience to others

2- Program Academic standards:

2.1 Knowledge & Understanding

By the end of the study of postgraduate diploma of any specialty, graduate must have sufficient knowledge & understanding of:

2.1.1 Basic facts, theories and recent advances of the environmental biotechnology and related subjects.

2.1.2 Basics , methodologies and scientific research ethics as its different tools

2.1.3 Ethical and legal fundamentals (research writing – supervising – authorizing – applying) and their applications on the field of environmental biotechnology.

2.1.4 Quality standards of professional practice in the field of environmental biotechnology.

2.1.5 Knowledge related to the professional practice impact on the environment development and conservation.

2.2 Intellectual Skills

By the end of the Doctorate program study in any specialty, the graduate must be able to:

2.2.1 Analyze, evaluate and deduce the information in the field of environmental biotechnology.

2.2.2 Solve the specialized problems according to available data of environmental biotechnology.

2.2.3 Conduct research studies that add knowledge to environmental biotechnology.

2.2.4 Write and publish scientific articles in the field of environmental biotechnology.

2.2.5 Evaluate professional practice risks in environmental biotechnology.

2.2.6 Plan to improve specialty performance in the field of environmental biotechnology.

2.2.7 Take decisions in various professional situations including dilemmas and controversial issues

2.2.8 Add to the specialty field through creativity & innovation.

2.2.9. Manage discussions on basis of evidence and proofs.

2.3. Professional skills

By the end of Doctorate program study in any specialty, the graduate must:

2.3.1 Master basic and advanced professional skills in the field of environmental biotechnology.

2.3.2 Write and appraise professional reports about environmental biotechnology.

2.3.3 Evaluate and improve methods and tools used in the field of environmental biotechnology.

2.3.4 Use technological tools to serve professional practice.

2.3.5 Plan for professional practice development and performance of others.

2.4. General & Transferable skills

By the end of the study of Doctorate program of any specialty, the graduate must:

2.4.1 Communicate effectively using different means.

2.4.2. Use information technology to improve professional practice.

2.4.3. Teach and evaluate others.

2.4.4. Perform self appraisal and seek continuous learning.

2.4.5. Use different resources to obtain information and knowledge.

2.4.6. Work in and lead a team.

2.4.7. Manage scientific meetings and time.

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Matrix between Graduate Attributes of the Program and Graduate Attributes from NAQAAE

Program Graduate Attributes	Graduate Attributes from NAQAAE														
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15
1.1	X														
1.2		X													
1.3			X												
1.4				X											
1.5					X										
1.6						X									
1.7							X								
1.8								X							
1.9									X						
1.10										X					
1.11											X				
1.12												X			
1.13													X		
1.14														X	
1.15															X

II

The Matrix Between Program ARS and ARS from NAQAAE

2.1 Knowledge & Understanding

Prog / ARS	ARS				
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5
3.1.1	X				
3.1.2		X			
3.1.3			X		
3.1.4				X	
3.1.5					X

2.2. Intellectual Skills

Prog / ARS	ARS								
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9
3.2.1	X								
3.2.2		X							
3.2.3			X						
3.2.4				X					
3.2.5					X				
3.2.6						X			
3.2.7							X		

3.2.8								**X**	
3.2.9									**X**

2.3.1 Professional Skills

Prog / **ARS**	**ARS**				
	2.3.1	**2.3.2**	**2.3.3**	**2.3.4**	**2.3.5**
3.3.1	**X**				
3.3.2		**X**			
3.3.3			**X**		
3.3.4				**X**	
3.3.5					**X**

2.3.2 General and Transferable skills

Prog / **ARS**	**ARS**							
	2.4.1	**2.4.2**	**2.4.3**	**2.4.4**	**2.4.5**	**2.4.6**	**2.4.7**	**2.4.8**
3.4.1	**X**							
3.4.2		**X**						
3.4.3			**X**					
3.4.4				**X**				

3.4.5					**X**			
3.4.6						**X**		
3.4.7							**X**	
3.4.8								**X**

Environmental Biotechnology Department

Doctorate Program Specification (2016/2017)

Doctorate Program Specification

(2016/2017)

A-Basic Information

1- Programme title: Doctorate in Environmental Biotechnology

2- Program type: **Single √** **Double** **Multiple**

Department: Environmental Biotechnology

Program Approval Date: 19/10/2016

B- Professional Information:

1- Program aims:

1.1. To prepare distinguished graduates capable to apply the most recent techniques in the field of environmental biotechnology.
1.2. To develop student environmental knowledge and skills to solve the theoretical and practical environmental problems.
1.3. To help students to acquire the skills of writing and publishing research papers in environmental biotechnology journals and scientific conferences.
1.4. To develop the student research team-work skills and setting research rules in the field of environmental biotechnology.
1.5. To enhance the students understanding of research system (input – process-output) and be able to develop and manage new vision toward supervising scientific research projects in the field of environmental biotechnology.

2- Intended learning outcomes (ILOs):

2/1 Knowledge and understanding:

By the end of this program, the graduate must able to:

a- Understand in depth the basic facts & theories of phytoremidiation, genetically engineered organisms in environment and bioprocess engineering.

b – Explain precisely the mutual links between environmental pollutants and chemical aspects of ecology.

c – Know critically the main scientific basics of using pesticides biotechnology on the environmental cleaning.

d – Express the fundamental of ethical and legal practice and their using in the biotechnology and molecular aspects of pesticides, genetically engineered organisms in environment and molecular aspects of pesticides toxicology.

e- Realize the actual quality standards of the analysis methods and determination of environmental pollutants.

f- Explain basics and ethics of scientific research fields,

g- Understand environmental terminology written in germane language and identify advanced computer models used in environmental biotechnology analysis.

2/2 Intellectual skills:

By the end of this program, the graduate must able to:

a- Innovate the suitable methods for Industrial pollution control.

b- Evaluate and determine the biological effect of toxicants, chemical aspects and phytoremidiation.

c- Interpret results of different methods of bioprocess engineering.

d- Determine different data and information needed to solve the problems of genetically engineered organisms in environment and industrial pollution control.

e- Distinguish between the different aspects of molecular pesticides toxicology.

f- Determine problems in the scientific researches of the environmental pollution.

g- Find solution to the risks imposed during the treatment and analysis of environmental pollutants.

h- Evaluate professional decision taking for bioprocess engineering.

2/3 Skills:

2/3/1 Professional and practical skills:

By the end of this program, the graduate must able to:

a – Write professional scientific reports in the field of environmental biotechnology.

b – Execute the basic and advanced professional skills in environmental biotechnology during the experimental work in research.

c –Select and evaluate methods and tools during the research in environmental biotechnology.

d – Prepare modern modules of environmental pollutants research.

e- Use professional technologies for serving research and practice.

2/3/2 General and transferable skills:

***By the end of this program, the graduate must able to*:**

a- Work in team with public, collagenous and appropriate authorities.

b- Show management skills for using information technology to improve his/her professional practice in internet and relative information.

c- Use different sources of information to obtain data for a given course topics.

d- Communicate with others and manage time effectively.

e- Show self learning abilities in situation comparable to his level.

f- Use audio and video means for displaying information to learn independently and seek continuous learning in environmental biotechnology research.

3- Program Academic standards:

3.1 Knowledge & Understanding

By the end of the study of postgraduate diploma of any specialty, graduate must have sufficient knowledge & understanding of:

3.1.1 Basic facts, theories and recent advances of the environmental biotechnology and related subjects.

3.1.2 Basics , methodologies and scientific research ethics as its different tools

3.1.3 Ethical and legal fundamentals (research writing – supervising – authorizing – applying) and their applications on the field of environmental biotechnology.

3.1.4 Quality standards of professional practice in the field of environmental biotechnology.

3.1.5 Knowledge related to the professional practice impact on the environment development and conservation.

3.2 Intellectual Skills

By the end of the Doctorate program study in any specialty, the graduate must be able to:

3.2.1 Analyze, evaluate and deduce the information in the field of environmental biotechnology.

3.2.2 Solve the specialized problems according to available data of environmental biotechnology.

3.2.3 Conduct research studies that add knowledge to environmental biotechnology.

3.2.4 Write and publish scientific articles in the field of environmental biotechnology.

3.2.5 5 Evaluate professional practice risks in environmental biotechnology.

3.2.6 Plan to improve specialty performance in the field of environmental biotechnology.

3.2.7 Take decisions in various professional situations including dilemmas and controversial issues

3.2.8 Add to the specialty field through creativity & innovation.

3.2.9. Manage discussions on basis of evidence and proofs.

3.3. Professional skills

By the end of Doctorate program study in any specialty, the graduate must:

3.3.1 Master basic and advanced professional skills in the field of environmental biotechnology.

3.3.2 Write and appraise professional reports about environmental biotechnology.

3.3.3 Evaluate and improve methods and tools used in the field of environmental biotechnology.

3.3.4 Use technological tools to serve professional practice.

3.3.5 Plan for professional practice development and performance of others.

3.4. General & Transferable skills

By the end of the study of Doctorate program of any specialty, the graduate must:

3.4.1 Communicate effectively using different means.

3.4.2. Use information technology to improve professional practice.

3.4.3. Teach and evaluate others.

3.4.4. Perform self appraisal and seek continuous learning.

3.4.5. Use different resources to obtain information and knowledge.

3.4.6. Work in and lead a team.

3.4.7. Manage scientific meetings and time.

4- Bench Marks:

Adopted from ARS of Doctorate programs from NAQAAE 2009 and approved by the department council.

5. Curriculum Structure and Contents:

a. Program duration: at least 3 years.

b. Program structure: No. of hours/units:

Lectures	Lab./Exercise		Total
20	16		36
Compulsory 24	Optional	---..	Elective 12

- **Basic sciences courses**

No.	%
6	16.6

- **Social sciences and humanity courses**

No.	%
3	8.3

Specialized courses

No.	%
21	58.3

- **Other sciences courses**

No.	%
6	16.6

	No.	%
▪ **Practical/Field Training**	The time spent in achievement of a thesis (8 hrs/week)	

c. Program Levels (in credit-hours system): Not Applied

d. Program courses:

1- Compulsory (General Courses):

Code No.	Course Title	No. of Units (hrs)	No. of hours/week			Year/Level	Semester
			Lect.	Ex.	App.		
	German language	3	3	-			
A-80	Computer	3	3	2			
	Research and research methodology	6	3	8			
B6-	Special topics (Optional)	3	3	-			
	Seminars	3	---	6			
A-24	Advanced biotechnology	3	3	-			
B6-22	Environmental systems	3	3	-			
	Total	24	18	16			

2. Provisional:

Code No.	Course Title	No. of Units	No. of hours/week			Year/Level	Semester
			Lect.	Ex.	App.		
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3. Elective:

4- Specialized courses (4 courses from the listed below courses)

Code	Course Title	No. of	No. of hours/week	Year/Le	Semester

No.		Units	Lect.	Ex.	Lab/App.	vel	
B6-9	Biological effect of toxicants	3	2				
B6-41	Phytoremidiation	3	2				
B6-14	Bioprocess engineering	3	2				
B6-35	Industrial pollution control	3	2				
B6-17	Chemical aspects of ecology	3	2				
B6-29	Field and laboratory of environmental quality	3	2				
B6-33	Genetically engineered organisms in environment	3	2				
B6-40	Pesticides biotechnology	3	2				
B6-47	Special topics	3	2				
B6-38	Molecular aspects of pesticides toxicology	3	2				
C4	Analytical methods in biotechnology II	3	2		2		

6. Program Contents:

Code No.	Course Title	Contents
	German language	1. Einfuhrung مقدمة 2.Das verbs الأفعال, Der artikel الاداة, Bestimmet and Unbestimmt المعرفة والنكرة 3.Nominativ und Akkusativ الفاعل والمفعول به, Personalpronomen الضمائر, Fragepronomen أدوات الاستفهام, plural الجمع 4.Die Zhalen الأعداد, Negativ النفي, Demonstrativpronomrn اسماء الاشارة 5.Verbzusatz + Verb, Vorsilb + Verb الافعال المكونة من مقطعين, Possessiv Pronomen ضمائر الملكية 6.Wissenschafliche Worte دراسة بعض المصطلحات العلمية الزراعية

Code No.	Course Title	Contents
		Die Lehrbucher من بعض الكتب العلمية 7- ويتم قراءة وشرح قطعة في كل درس من الدروس السابقة
A - 81	Advanced computer	1. Overview and functions of a computer system, storage, devices, memory, etc 2. Types of Processing: Batch, Real-Time, Online, Offline. 3. Types of modern computers: The workstation, The Minicomputer, Mainframe Computers, Parallel Processing Computer, The Super Computer, etc. 4. Introduction to operating systems: Windows/Unix/Linux. 5. The Internet and its Resources, World Wide Web (WWW): associated tools, services, resources and various terminologies, advance search techniques 6. Computer Networking; Fundamentals of networking: OSI Reference Model, TCP/IP, topologies and protocols, designing networks. 7. Networking gadgets (Router, Switch, etc); Data Communication (ISDN, VPN, DSL, cable modem, cellular modem, etc); Communication Links (Wire pairs, Coaxial cables, Fiber optics, Microwave, Satellite, etc).
	Research and Research methodology II	1. Methods of thinking 2. Researcher Preparation 3. Characteristics science and types of experiments 4. Role played by chance and hypotheses in research 5. Research Methodology 6. Research planning and design of experiments 7.
	Special Topics	1. Environmental pollution 2. Chemistry and Biology of water

Code No.	Course Title	Contents
		3. Wastewater pollution and hazards management 4. Bioremediations and Biodegradations 5. Biofertilizer and Biocontrol 6. Genetically modified microorganisms 7. Problems and answers
	Seminars	1. Treatment of chemical and biological wastes. 2. Production of enzymes from microorganisms. 3. Pollution and environment. 4. Genetic toxicology and environment 5. Bioremediation and environment. 6. Using of biofertilizer to produce more healthy food. 7. Biological control of some pathogen attack to plants.
B6-٩	Biological effect of toxicants	1. Introduction to occurrence of toxicants 2. Toxic action of pollutants 3. Xenobiotic action and factors affecting it 4. Biotransformation defense mechanisms to toxicants 5. Sources of pollution 6. Pesticides and related compounds 7. Endocrine disorders carcinogenic effects of pollutants
B6-٤١	Phytoremidiation	1. Bioremediation and phytoremediation 2. Methods for rhizoremediation 3. Rhizosphere and metal remediation 4. Enhanced heavy metal phytoextraction, and enzymes transferring biomolecules to organic foreign compounds 5. Phytoremediation of polychlorinated biphenyls. 6. Metabolism and genetic engineering studies for herbicide phytoremediation and pesticides removal 7. Phytoremediation of volatile organic compounds
B6-14	Bioprocess engineering	1. Introduction, Economic impact of biotechnology, Scaling up of

Code No.	Course Title	Contents
		products 2. Material balance and Energy balance 3. Unsteady state, Fluid flow and mixing 4. Heat transfer, and Mass transfer 5. Unit operation, 6. Chemicals and Biopharmaceuticals industries 7. Biochemical products
B6-35	Industrial pollution control	1- 1. Types of industrial wastes. 2- On-sit monitoring and analysis of industrial pollutants. 3- Methods of industrial air pollution control. 4- Clean production. 5- Treatment of chemical industries wastes. 6- Treatment of metal finishing wastes. 7- Treatment of textile wastes.
B6-17	Chemical aspects of ecology	1. Nature and types of water pollutants 2. Elemental pollutants and Heavy metals 3. Inorganic species and organic pollutant 4. Inorganic species and organic pollutant 5. Radionuclide in the aquatic environment 6. Oxygen, oxidants and reductants. 7. Inversions and air pollution.
B6-22	Environmental systems	1. Earth environmental systems , (atmosphere and Ocean) 2. Climate & Natural Environment 3. Natural and human-induced environmental processes 4. Relationship between the human and physical aspects of the environment 5. Human, biological and/or physical environment issue, their investigation and management 6. Application of scientific and social science information to environmental problems

Code No.	Course Title	Contents
		7. Effect of human activity on climate change
B6-29	Field and laboratory of environmental quality	1. Introduction& Importance of good sampling 2. Air analysis& HPLC tests 3. Gas chromatography tests& Mass spectroscopy tests 4. Statistical Evaluation& Water analysis 5. Physical & Chemical analysis 6. Biochemical analysis 7. Soil analysis& Environmental standards
B6-33	Genetically engineered organisms in environment	1. Microbial Biotechnology: chemical production and bioremediation 2. Engineering Microbes for Bioadsorbents for Metal 3. Biodegradation of halogenated organic compounds 4. Engineering Microbes for Biodegradation, Bioremediation 5. Principles of Evolution Applied to Microbial Catabolism 6. Gene Transfere in the Evolution of Catabolic Pathways 7. The present Impact of Genomics and Functional Genomics in the Microbial Biocatalysis
B6-40	Pesticides biotechnology	1. Pesticides and Biopesticides, Progress, Problems, and potential 2. Pesticides and Biopesticides, Progress, Problems, and potential 3. Production of Pesticides and its Toxic metabolites 4. Physiological approaches to improve Pesticides Biotechnology 5. Application of pesticides Biotechnology in Egypt 6. The Commercial use of Biopesticides in Organic farms in Egypt. 7. Safety of Pesticides Biotechnology.
B6-38	Molecular aspects of	1. The toxic action of pesticides on target organisms and

Code No.	Course Title	Contents
	pesticides toxicology	Human Health. 2. The environmental fate of pesticides, degradation, and problems associated 3. Advantages or disadvantages of new molecular biotechnologies in pesticides 4. The molecular mechanisms of pesticide action on target and non-target organism 5. Xenobiotic metabolism of pesticides and molecular mechanisms of pesticide resistance. 6. The effects of pesticides in a variety of vertebrate and invertebrate systems 7. The molecular biological techniques and its use to detect mutations.
C4	Analytical methods in biotechnology II	1. Basics, theory and mechanism of electrophoresis. 2. Types and application of electrophoresis. 3. Basics and theory of spectroflourometry. 4. Enzyme analysis and Purification. 5. PCR technique. 6. Theory and application of Mass spectroscopy. 7. Problems and answers.

7. Program admission requirements:

1. Bachelor degree from appropriate practical faculty from Egyptian or an equivalent university with general grade (Pass), diploma in the field of Environmental biotechnology and master in the field of Environmental biotechnology.

8. Regulations for progression and program completion:

- Successful completion of the required courses (equivalent to at least18 units) in addition to compulsory courses: German language, advanced computer, Research and research, special topics and Seminars.

- Student success in any course of study is estimated in one of the following estimates:

Excellent	From 90 to 100 degrees

Very Good	From 80 to less than 90 degrees
Good	From 70 to less than 80 degrees
Pass	From 60 to less than 70 degrees

- Successfully passes of both oral and written qualifying examinations.

- Approved completion of the research experiments.

- Approved scientific writing of Ph.D. dissertation.

- Successfully passes of dissertation open defense examination.

9. Assessment methods for Evaluating program Applicants:

No.	Method	Intended Learning Outcomes ' ILO's '
1	Semester Works(5^{th}&10^{th})	Measure Problems Solving Skills, Presentation, and Self learning.
2	Midterm Exam (6^{th}) Week.	Measure Abilities on Concentration and Understanding Scientific Points & Background.
3	Practical Exam (13^{th}) Week.	Measure Practices & Applications Skills and Professional & art Skills.
4	Oral Exam (14^{th}) Week.	Measure Analysis, Presentation and Discussion Skills.
5	Written (Final) Exam (15^{th}) Week.	Measure Knowledge, Understanding, Intellectual and Professional skills.

10. Program Evaluation methods:

No.	Evaluator	Tool	Sample
1	Students	Questionnaire	20
2	Alumni	Depth Meeting	5
3	Stakeholders (Employers)	Nucleus Meeting	5
4	External (Evaluators & Examiners)	Remarking Questionnaire & Nucleus Meeting	2

5	Others	Not Applied	---------

Program coordinator: Dr Samar Abdel-Hameed Aly

Head of department: Prof. Dr./ Nashwa Mokhtar Hassan Rizk

Matrix of courses and ILOs (Knowledge and Skills) of Environmental Biotechnology Doctorate Program

No.	Course No.	Course title	Knowledge and understanding	Intellectual abilities	Professional and practical skills	General and transferable skills
1		German Language	2/1(f)	2/2(i)	-	2/3/2(g)
2		Research and Research Methodology	2/1(f)	2/2(f)	2/3/1(a)	2/3/2(f)
3	A-81	Advanced Computer	-	2/2(d)	2/3/1(d)	2/3/2(c)
4		Special Topics	2/1(f)	2/2(h)	2/3/1(b)	2/3/2(b)
5		Seminars	2/1(e)	2/2(i)	2/3/1(b)	2/3/2(d)
6	B6-٩	Biological effect of toxicants	2/1(b)	2/2(b)	2/3/1(b)	2/3/2(c)
7	B6-٤١	Phytoremidiation	2/1(a)	2/2(b)	2/3/1(c)	2/3/2(c)
8	B6-14	Bioprocess engineering	2/1(c)	2/2(c)	2/3/1(a)	2/3/2(f)
9	B6-35	Industrial pollution control	2/1(c)	2/2(e)	2/3/1(b)	2/3/2(a)
10	B6-17	Chemical aspects of ecology	2/1(d)	2/2(b)	2/3/1(c)	2/3/2(d)
11	B6-22	Environmental systems	2/1(b)	2/2(b)	-	2/3/2(d)
12	B6-29	Field and laboratory of environmental quality	2/1(a)	2/2(b)	2/3/1(a)	2/3/2(e)
13	B6-33	Genetically engineered organisms in environment	2/1(d)	2/2(e)	2/3/1(c)	2/3/2(e)
14	B6-40	Pesticides biotechnology	2/1(c)	2/2(e)	2/3/1(c)	2/3/2(a)
15	B6-38	Molecular aspects of pesticides toxicology	2/1(d)	2/2(e)	2/3/1(c)	2/3/2(e)
16	C4	Analytical methods in biotechnology II	-	2/2(g)	2/3/1(a)	2/3/2(e)

The matrix between Program ARS and Program ILO's

Profram Academic Standards	Program ILO's (Knowledge & Understanding)						
	2/1a	2/1b	2/1c	2/1d	2/1e	2/1f	2/1g
2.1.1	X						
2.1.2		X					
2.1.3			X				
2.1.4				X			
2.1.5					X	X	X

2/1 (Knowledge & Understanding)

2/2 Intellectual Skills

Program Academic Standard	Program ILO's (Intellectual Skills)								
	2/2a	2/2b	2/2c	2/2d	2/2e	2/2f	2/2g	2/2h	
2.2.1	X								
2.2.2		X							
2.2.3			X						
2.2.4				X					
2.2.5					X				
2.2.6						X			
2.2.7							X	X	

2/3/1 (Practical and professional Skills)

Program Academic Standard	Program ILO's (Practical and professional Skills)				
	2/3/1a	2/3/1b	2/3/1c	2/3/1d	2/3/1e
2.3.1	X				
2.3.2		X			
2.3.3			X		
2.3.4				X	
2.3.5					X

2/3/2 (General and Transferable skills)

Program Academic Standard	Program ILO's (General and Transferable skills)								
	2/3/2a	2/3/2b	2/3/2c	2/3/2d	2/3/2e	2/3/2f	2/3/2g	2/3/2h	2/3/2i
2.4.1	X								
2.4.2		X							
2.4.3			X						
2.4.4				X					
2.4.5					X				
2.4.6						X			
2.4.7							X		
2.4.8								X	

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