University of Sadat City
Genetic Engineering and
Biotechnology Research Institute.
Quality Assurance and Continuous
Improvement Unit

جامعة مدينة السادات
معهد بحوث الهندسة الوراثية والتكنولوجيا الحيوية
وحدة ضمان الجودة والتطوير المستمر

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Department of Plant Biotechnology

I

Academic Reference Standards for Master Postgraduate Studies of Plant Biotechnology

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

1-The graduate of Master 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 Master 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 Master 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 Master 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 Master 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.

Plant Biotechnology Master Program Academic Reference Standards

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 plant biotechnology
1.2. Add to the knowledge in the field of plant 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 plant 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 master of plant biotechnology, graduate must have sufficient knowledge & understanding of:

2.1.1 Basic facts, theories and recent advances of the plant 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 plant biotechnology.
2.1.4 Quality standards of professional practice in the field of plant 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 master program in plant biotechnology specialty, the graduate must be able to:

2.2.1 Analyze, evaluate and deduce the information in the field of plant biotechnology.
2.2.2 Solve the specialized problems according to available data of plant biotechnology.
2.2.3 Conduct research studies that add knowledge to plant biotechnology.
2.2.4 Write and publish scientific articles in the field of plant biotechnology.
2.2.5 5 Evaluate professional practice risks in plant biotechnology.
2.2.6 Plan to improve specialty performance in the field of plant 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 the master program in plant biotechnology specialty, the graduate must be able to:

2.3.1 Master basic and advanced professional skills in the field of plant biotechnology.
2.3.2 Write and appraise professional reports about plant biotechnology.
2.3.3 Evaluate and improve methods and tools used in the field of plant 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 master program in plant biotechnology specialty, the graduate must be able to:

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.

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

	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
Program Graduate Attributes	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

II
The Matrix Between Program ARS and ARS from NAQAAE

2.1 Knowledge & Understanding

	ARS

	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5
Program ARS	3.1.1				
		3.1.2			
			3.1.3		
				3.1.4	
					3.1.5

2.2. Intellectual Skills

	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
Program ARS	3.2.1								
		3.2.2							
			3.2.3						
				3.2.4					
					3.2.5				
						3.2.6			
							3.2.7		
								3.2.8	
									3.2.9

2.3.1 Professional Skills

	ARS				
	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5
Program ARS	3.3.1				
		3.3.2			
			3.3.3		
				3.3.4	
					3.3.5

2.3.2 General and Transferable skills

	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
Program ARS	3.4.1							
		3.4.2						
			3.4.3					
				3.4.4				
					3.4.5			
						3.4.6		
							3.4.7	
								3.4.8

المعايير القياسية والتوصيف لبرنامج
الماجيستير لقسم البيوتكنولوجيا النباتية

Plant Biotechnology

Master

Program Specification

(2015/2016)

University: University of Sadat city

Institute: Genetic engineering and Biotechnology Research Institute

Program Specification

A-Basic Information

1- Program title: Master of Science in Plant Biotechnology

2- Program type: Single √ Double Multiple

3- Department: Plant Biotechnology

4- Program coordinator: Dr. Heba Shahin

5- Program Approval Date: 20 /9/2015

6- Program internal reviewer: Ass.Prof. Dr. Yehia Khedr, (GEBRI, University of Sadat City)

7- Program external reviewer: Prof. Dr. Abd Alfatah Badr (Faculty of science Helwan University)

B- Professional Information:

1- Program aims:

Preparation of Master graduate capable of:

1.1 Preparing Master Graduate having capability of applying the basics and methodologies of scientific research using its different tools in the field of plant biotechnology and relating interest.

1.2 Enhancing basic graduate knowledge and provide specialist theory and practical training in plant molecular and biotechnology subjects.

1.3 Improving skills of the Master graduate in identifying problems and using available resources to solve them & to achieve highest benefits.

1.4 Applying analytical methods & specialized knowledge and using appropriate technological means in plant biotechnology.

1.5 Providing training in the science behind plant biotechnology, an appreciation of the current scope and limits to its industrial application, and the implications of modern methods of genetic modification for plant industries.

1.6 Imparting understanding of the principles of the plant sciences and molecular biology, as well as the integration of these disciplines, to provide healthy plants in a safe environment for food, non-food, feed and health applications.

1.7 Exploring the broad area of plant biotechnology, including the scientific principles underpinning these practices.

2- Intended learning outcomes (ILOs):

2/1 Knowledge and understanding:

By the end of this program, the graduate will be able to:

a. Describe basic facts and theories of biotechnology, general issues and application of plant gene technology.
b. Express the basic information of plant molecular biology methods and their application.
c. Classify the different methods of analysis for plant natural products, secondary metabolites, methods of plant breeding.
d. Summarize fundamental of plant breeding and its use in plant improvements against insects and plant diseases, plant cell, tissue and organ culture, plant growth regulators and its application for plant production.
e. Describe the principles of genetics and cytogenetics, plant genetic protection, plant tissue culture techniques, plant transformation, plant propagation, hydroponics, roles of plant diseases and control, plant molecular pathology, and the main concept of somatic embryogenesis and somaclonal variation.
f. Express the attitudes and ethical basis in scientific research and in plant biotechnology and summarize main basics & ethics of scientific researches.
g. Write list of the basic rules and scientific terms of English language in plant biotechnology area.
h. Acquire the necessary knowledge base of computer science in plant biotechnology.

2/2 Intellectual abilities:

By the end of this program, the graduate will be able to:

a. Appoint suitable methods for different biological treatment of plant biotechnology, and plant tissue culture.
b. Plan the identification of plant gene technology and role of plant growth regulators in plant development.
c. Compare among different aspects of plant improvement through plant molecular biology and cytogenetics, plant breeding, and plant transformation and somaclonal variation.
d. Interpret different information to solve the problems of different stress facing plant biotechnology, plant breeding, and propagation.
e. Analyze the natural products in plants; diagnose plant diseases using an integrated multidisciplinary approach.
f. Derive issues which the scientifics facing during plant improvement and biotechnology and take a professional decision for suitable methods to improve the productivity and quality of plants and plant genetic protection.
g. Plan paraphrasing English technical terms processes used in scientific researches.

2/3 Professional Skills:

By the end of this program, the graduate will be able to:

a - Apply the different methods for plant improvement via plant biotechnology.
b – Measure natural plant products and diagnose plant diseases through molecular methods.
c – Evaluate techniques and tools during the experimental part of research.
d- Prepare technical reports and scientific essay

2/4. General and transferable Skills:

By the end of this program, the graduate will be able to:

a- Communicate effectively using all methods with public, collegeous and appropriate authorities.
b- Use information technology to improve professional practice in internet and relative information.
c- Practice self appraisal and determines his/her learning needs.
d- Use different sources of information to obtain data for a given course topics.
e- Work in teams and manage time effectively.
f- Work as team leader in situation comparable to his level.
g- Learn independently and seek continuous learning in plant biotechnology.
h- Take professional decision for suitable methods in plant biotechnology subjects.
i- Manage time efficiently with other groups.

3- Program Academic standards:

Academic Standards of plant Biotechnology PhD program was prepared according to **Graduate Attributes from NAQAAE and** approved in department council № ( ) date /9/ 2015, and in faculty council № ( ) date / / 2015.

3.1 Knowledge & Understanding

By the end of Master Program in plant biotechnology, the graduate should have sufficient knowledge & understanding of:

3.1.1 Basic facts, theories of the plant biotechnology and related subjects.
3.1.2 Mutual effects between professional practice and environment of plant biotechnology and effects on environment.
3.1.3 Main scientific advances of plant biotechnology practice.
3.1.4 Ethical and legal fundamentals and their application in the field of plant biotechnology researches.
3.1.5 Quality standards of professional practice in the field of plant biotechnology.
3.1.6 Basics and ethics of scientific research in the field of plant biotechnology.

3.2 Intellectual Skills

By the end of Master Program in plant biotechnology, the graduate must be able to:

3.2.1 Interpret, analyze & evaluate the information to solve problems in the field of plant biotechnology.
3.2.2 Solve some problems that do not conform to classic data regarding plant biotechnology.
3.2.3 Integrate different information to solve professional problems in the field of plant biotechnology.
3.2.4 Conduct a scientific research and/ or write scientific systematic approach to a research problem (hypothesis) in the field of plant biotechnology.
3.2.5 Evaluate professional risks of plant biotechnology.
3.2.6 Plan for professional improvement in the field plant biotechnology.
3.2.7 Take professional decisions in plant biotechnology fields.

3.3. Professional and Practical skills

By the end of Master Program in plant biotechnology, the graduate must be able to:

3.3.1 Competent in all basic and some of the advanced professional skills in plant biotechnology fields.
3.3.2 Write and appraise reports about plant biotechnology.
3.3.3 Evaluate methods and tools used in plant biotechnology fields.

3.4. General & Transferable skills

By the end of Master Program in plant biotechnology, the graduate must be able to 3.4.1 Communicate effectively using all methods.
3.4.2 Use information technology to improve professional practice.
3.4.3 Practice self appraisal and determines learning needs.
3.4.4 Utilize different information sources to obtain data. Share in determination of standards for evaluation of others (e.g.: subordinates/ trainees etc.)
3.4.5 Determine standards for evaluation of others (e.g.: subordinates/ trainees etc.)
3.4.6 Work in and lead a team in comparable work level..
3.4.7 Manage time effectively.
3.4.8 Learn independently.

4- Bench Marks: ARS

There is external Bench Mark for specialist interest of plant biotechnology.

Master of Biotechnology (Plant Biotechnology) The University of Adelaide, Australia

http://www.adelaide.edu.au/degree-finder/mbiot_mbiotechpb.html

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5- Curriculum Structure and Contents:

a. Program duration: at least 2 years.

b. Program structure:

No. of hours/units: 36 Units

Lectures	27	Lab./ Exercise	18	Total	45
Compulsory	32			Elective	13

	No.	%
▪ Basic sciences courses	9	20
▪ Social sciences and humanity courses	3	6.7
▪ Specialized courses	30	66.7
▪ Other sciences courses	3	6.6

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

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

6-Program courses:

a- Compulsory (General Courses):

Code No.	Course Title	No. of Units (hrs)	No. of hours/week			Year/Level	Semester
			Lect.	Ex.	Lab/ App		
	Research and research methodology	6	2		8		
A-23	Biotechnology I	3	3				
A-35	English language	3	3				
A-66	Plant biotechnology	3	3				
A-80	Use of microcomputer: level 2	3	2		2		
B3-65	Special topics	3	3				
B3-66	Seminars	3	---		6		
	Total	24	16		16		

b- Elective: Specialized courses (At least 4 courses from the listed below courses)

Code No.	Course Title	No. of Units	No. of week/hours			Year/Level	Semester
			Lect.	Lab.	Ex.		
A-25	Biotechnology in plant nutrition	3	3				
A-38	Fundamentals of plant propagation and micro-propagation	3	3				
A-65	Physiology of plant growth regulators	3	3				
B3-1	Advanced plant breeding I	3	3				
B3-10	Biotechnology of secondary metabolites	3	3				
B3-15	Crop breeding	3	3				
B3-20	Field crop biotechnology I	3	3				
B3-26	Genetic and cytogenetic in crops	3	3				
B3-31	Hydroponics	3	3				
B3-33	Methods of plant breeding	3	3				
B3-40	Natural products from plants	3	3				
B3-42	Plant breeding for pest and	3	٣				

	disease resistance						
B3-43	Plant breeding for stress	3	3				
B3-45	Plant diseases	3	3				
B3-48	Plant gene technology	3	3				
B3-51	Plant molecular biology methods	3	3				
B3-55	Somaclonal variation	3	3				
B3- 56	Somatic embryogenesis and synthetic seeds	3	3				
B3-59	Tissue and cell culture practices in plants	3	3				
B3-61	Transgenic plants	3	3				
C-34	Experiments in plant tissue culture-III	3	2	2			
C-89	Molecular methods in plant pathology- I	3	2	2			

c- M.Sc. thesis

All MSc-degree students should prepare a thesis in plant biotechnology. The department and the ethical committees must approve the protocol of the research. The thesis should include a review part and a research part. The thesis is supervised by one or more senior staff members of the plant Biotechnology Department and may include other specialties according to the nature of the research. The thesis should be evaluated and approved by a committee of three professors including one of the supervisors and an external professor.

7. Program admission requirements:

- Bachelor degree in appropriate practical faculty from one of the Egyptian Universities or an equivalent with minimal general grade (Acceptable).
- Or Diploma from plant biotechnology department in the Institute.

8. Regulations for progression and program completion:

Successful completion of the required courses (equivalent to at least 12 units, 4 courses containing at least one practical course) in addition to compulsory courses: English language, Computer, Research and research methodology, 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

- Approved completion of the research experiments.
- Approved scientific writing of M.Sc. thesis.
- Successfully passes of thesis open defense examination

9. Program admission requirements:

No.	Method	Intended Learning Outcomes ' ILO's '
1	Semester Works (5th & 10th)	Measure Problems Solving Skills, Presentation Data and Discussion and Work on team.
2	Midterm Exam (6th) Week.	Measure Abilities on Concentration and understanding Scientific Points & Background.
3	Oral Exam (14th) Week.	Measure Analysis, Presentation and Discussion Skills.
4	Written (Final) Exam (15th) Week.	Measure Remembering & Innovating Skills.
5	Thesis discussion	To assess the ability to write a review article, perform the needed practical steps and to present the results in tables and graphs. In addition, the skills of analysis of results and discussion with previous findings obtained by other authors are also assessed.

10. Program Evaluation methods:

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

Program coordinator: Dr. / Heba Shahin

Head of department: Prof. Haroun Abou Shama

Matrix of courses and ILO's (Knowledge and Skills) of Plant Biotechnology Doctorate Program Targeted

No.	Course No.	Course title	Knowledge and understanding							
			a	b	c	d	e	f	g	h
1		Research and research methodology						x		
2	A-23	Biotechnology I	x							
3	A-25	Biotechnology in plant nutrition	x							
4	A-35	English language							x	
5	A-38	Fundamentals of plant propagation and micro-propagation				x				
6	A-65	Physiology of plant growth regulators				x				
7	A-66	Plant biotechnology	x							
8	A-80	Use of microcomputer: level 2								x
9	B3-1	Advanced plant breeding -1				x				
10	B3-10	Biotechnology of secondary metabolites			x					
11	B3-15	Crop breeding			x					
12	B3-20	Field crop biotechnology I	x							
13	B3-26	Genetic and cytogenetic in crops					x			
14	B3-31	Hydroponics					x			
15	B3-33	Methods of plant breeding			x					
16	B3-40	Natural products from plants			x					
17	B3-42	Plant breeding for pest and disease resistance				x				
18	B3-43	Plant breeding for stress				x				
19	B3-45	Plant diseases				x				
20	B3-48	Plant gene technology	x							
21	B3-51	Plant molecular biology methods		x						
22	B3-55	Somaclonal variation					x			
23	B3-56	Somatic embryogenesis and synthetic seeds					x			
24	B3-59	Tissue and cell culture practices in plants				x				
25	B3-61	Transgenic plants					x			
26	B3-65	Special topics						x		
27	B3-66	Seminars						x		
28	C-34	Experiments in plant tissue culture-III				x				
29	C-89	Molecular methods in plant pathology- I					x			
MSc Thesis			x	x	x	x	x	x	x	x

No.	Course No.	Course title	Intellectual Skills						
			a	b	c	d	e	f	g
1		Research and research methodology						x	
2	A-23	Biotechnology I	x						
3	A-25	Biotechnology in plant nutrition	x						
4	A-35	English language							x
5	A-38	Fundamentals of plant propagation and micro-propagation				x			
6	A-65	Physiology of plant growth regulators		x					
7	A-66	Plant biotechnology	x			x			
8	A-80	Use of microcomputer: level 2						x	
9	B3-1	Advanced plant breeding -1			x				
10	B3-10	Biotechnology of secondary metabolites	x			x			
11	B3-15	Crop breeding			x	x			
12	B3-20	Field crop biotechnology I	x			x			
13	B3-26	Genetic and cytogenetic in crops			x				
14	B3-31	Hydroponics						x	
15	B3-33	Methods of plant breeding			x	x			
16	B3-40	Natural products from plants					x		
17	B3-42	Plant breeding for pest and disease resistance			x				
18	B3-43	Plant breeding for stress				x			
19	B3-45	Plant diseases					x		
20	B3-48	Plant gene technology		x					
21	B3-51	Plant molecular biology methods			x				
22	B3-55	Somaclonal variation			x				
23	B3-56	Somatic embryogenesis and synthetic seeds				x			
24	B3-59	Tissue and cell culture practices in plants	x						
25	B3-61	Transgenic plants			x				
26	B3-65	Special topics						x	
27	B3-66	Seminars						x	
28	C-34	Experiments in plant tissue culture-III	x						
29	C-89	Molecular methods in plant pathology- I			x				
MSc Thesis			x	x	x	x	x	x	x

No.	Course No.	Course title	Professional skills			
			a	b	c	d
1		Research and research methodology				x
2	A-23	Biotechnology I	x			
3	A-25	Biotechnology in plant nutrition	x			
4	A-35	English language				x
5	A-38	Fundamentals of plant propagation and micro-propagation	x			
6	A-65	Physiology of plant growth regulators	x			
7	A-66	Plant biotechnology	x			
8	A-80	Use of microcomputer: level 2				x
9	B3-1	Advanced plant breeding -1			x	
10	B3-10	Biotechnology of secondary metabolites		x		
11	B3-15	Crop breeding	x			
12	B3-20	Field crop biotechnology I			x	
13	B3-26	Genetic and cytogenetic in crops	x			
14	B3-31	Hydroponics			x	
15	B3-33	Methods of plant breeding	x			
16	B3-40	Natural products from plants		x		
17	B3-42	Plant breeding for pest and disease resistance			x	
18	B3-43	Plant breeding for stress		x		
19	B3-45	Plant diseases		x		
20	B3-48	Plant gene technology	x			
21	B3-51	Plant molecular biology methods		x		
22	B3-55	Somaclonal variation			x	
23	B3-56	Somatic embryogenesis and synthetic seeds	x			
24	B3-59	Tissue and cell culture practices in plants	x			
25	B3-61	Transgenic plants	x			
26	B3-65	Special topics			x	
27	B3-66	Seminars			x	
28	C-34	Experiments in plant tissue culture-III			x	
29	C-89	Molecular methods in plant pathology- I		x		
MSc Thesis			x	x	x	x

No.	Course No.	Course title	General and transferable Skills								
			a	b	c	d	e	f	g	h	i
1		Research and research methodology								x	
2	A-23	Biotechnology I					x				
3	A-25	Biotechnology in plant nutrition							x		
4	A-35	English language				x					
5	A-38	Fundamentals of plant propagation and micro-propagation						x			
6	A-65	Physiology of plant growth regulators			x						
7	A-66	Plant biotechnology	x								
8	A-80	Use of microcomputer: level 2		x							
9	B3-1	Advanced plant breeding -1									x
10	B3-10	Biotechnology of secondary metabolites					x				
11	B3-15	Crop breeding	x								
12	B3-20	Field crop biotechnology I				x					
13	B3-26	Genetic and cytogenetic in crops		x				x			
14	B3-31	Hydroponics									x
15	B3-33	Methods of plant breeding							x		
16	B3-40	Natural products from plants				x					
17	B3-42	Plant breeding for pest and disease resistance									x
18	B3-43	Plant breeding for stress						x			
19	B3-45	Plant diseases									x
20	B3-48	Plant gene technology					x				
21	B3-51	Plant molecular biology methods		x							
22	B3-55	Somaclonal variation							x		
23	B3-56	Somatic embryogenesis and synthetic seeds				x					
24	B3-59	Tissue and cell culture practices in plants						x			
25	B3-61	Transgenic plants	x								
26	B3-65	Special topics								x	
27	B3-66	Seminars									x
28	C-34	Experiments in plant tissue culture-III						x			
29	C-89	Molecular methods in plant pathology- I			x						
MSc Thesis			x	x	x	x	x	x	x	x	x

The matrix between Program ARS and Program ILO's

2/1 (Knowledge & Understanding)

Program Academic Standard	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

2/2 Intellectual Skills

Program Academic Standard	Program ILO's (Intellectual Skills)								
	2/2a	2/2b	2/2c	2/2 d	2/2e	2/2f	2/2g	2/2 h	2/2i
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	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
2.3.1	X			
2.3.2		X		
2.3.3			X	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	
2.4.9									X

Program coordinator: Dr. / Heba Shahin

Head of department: Prof. / Haroun Abou Shama

Course Specifications

1. Course information:							
Course Code:	A-23	**Course Title:**	Biotechnology-I				
No. units	3	**Lec.**	3	**App.**	-	**Level**	M.Sc.
Department	Plant Biotechnology						

2. Course Aims	
	Providing participants with the skills, knowledge and experience that are needed to pursue a successful career in biotechnology. The course focuses on the adaptation and application of biological processes for environmental and industrial use. This course would be suitable for graduates with a primary degree in the Biological Sciences who wish to extend their knowledge and skills for a career in the biotechnology sector.

3. Intended Learning Outcomes of Course (ILO's)	
a. Knowledge and Understanding:	a/1- Recognize the basic rules of bioprocess technology, genetic technology and immunodiagnostics. a/2- Outline the fundamentals protein technology and bioremediation. a/3- Describe quality standards for the efficient and safe running of industrial biotechnology enterprises..
b. Intellectual skills:	b/1- Link between bioprocess technology and its applications. b/2- Explain the various types of protein technology. b/3- Discuss the quality standards of industrial biotechnology. b/4- Differentiate the different methods of bioremediation process.
c. Professional Skills of course:	c/1- Deal with the various methods bioprocess technology, protein technology and bioremediation. c/2- Apply the various methods for genetic technology. c/3- Determine the quality standards of industrial biotechnology.
d. General and Transferable Skills	d/1- Experience in getting knowledge from data sources, e.g., text books, scientific journals, internet, multimedia……etc. d/2- Create thinking skills through analysis of data. d/3- Acquire of self confidence and leadership skills.

	d/4- Organize and manage scientific seminars and presentation. d/5- Self-learn and distance learn capabilities.

	4. Course Contents:
Week No.	**Topic**
1&2	Bio-Process Technology: the technology of culturing cells and unicellular organisms for biological molecule production.
3&4	Genetic Technology: tools and techniques for genetic analysis and applications to food and healthcare industries
5&6	Immunodiagnostics: the generation of antibodies and development of antibody-based technologies for application in diagnostic and research laboratories
7&8	Protein Technology: how protein synthesis and function have been enhanced to produce biopharmaceutical and industrial proteins on a commercial scale.
9&10	Quality Standards: quality standards for the efficient and safe running of industrial biotechnology enterprises.
11&12	Bioremediation
13&14	Biotechnology Resources: Periodicals, Web Sites, General Science Journals Biotech Education & Careers

5. Teaching and Learning Methods	
	1-Persentations 2-Projector slides 3-Data show 4- Lectures

6. Teaching and Learning Methods (for students with special needs)	**Not applicable**

7. Student Assessment:	
a. Assessment Methods:	*Semester works, *Midterm exam, *Oral exam**,** *Written (Final) exam**.**
b. Assessment Schedule	* (5^{th}&10^{th} weeks)**,** * (6^{th}) Week**,**

	* (14th) Week, * (15th) Week.
c. Weighting of Assessments	10 degrees ratios 10%, 10 degrees ratios 10%, 20 degrees ratios 20 %, 60 degrees ratios 60% Total 100 degrees ratios 100%

8. List of References:	
a. Notes	Handout notes
b. Essential Books (Text Books)	1- The Guide to Biotechnology (2007)is compiled by the Biotechnology Industry Organization (BIO)Debbie Strickland, BIO, Director of Marketing, Editor C o n t r i b u t o r s Deb Carstoiu, BIO, Director of State Media Relations and Advocacy Elinor Van Dyck, Blue House Publishing, Art Director Barbara Glenn, BIO, Managing Director of Animal Bitoechnology Crispin Littlehales, Writer/Editor Adrienne Massey, Ph.D., Writer/Editor. 2- Owen, M. R. L. and Pen, J. 1996. Transgenic plants:a production system for industrial and pharmaceutical proteins,John Wiley & sons,New York.350p.. 3- Current Topics in Microbiology and Immunology ISSN 0070-217x Library of Congress Catalog Number: 2008931406 © 2009 Springer-Verlag Berlin Heidelberg
c. Periodicals, Web Sites, … etc ...	1- www. Wiley. Com 2- Casida, L. E. Jr. 1996. Industrial microbiology. Wiley Eastern 3- www. Nature Biotechnology 3- www. Pubmed. com

Course coordinator : Prof.. Omima Khamis

Head of the department council: Prof. Haroun Abou Shama

Matrix of Knowledge and skills of Biotechnology I course (A-23)

Course Contents	Week No.	a-Knowledge and Understanding	b-Intellectual skills	c-Professional Skills of course	d-General and Transferable Skills
BioProcess Technology: the technology of culturing cells and unicellular organisms for biological molecule production.	**1&2**	a/1	b/1	c/1	d/1,
Genetic Technology: tools and techniques for genetic analysis and applications to food and healthcare industries	**3&4**	a/1	b/2	c/2	d/1, d/3
Immunodiagnostics: the generation of antibodies and development of antibody-based technologies for application in diagnostic and research laboratories	**5&6**	a/1, a/3	-	-	d/1, d/4
Protein Technology: how protein synthesis and function have been enhanced to produce biopharmaceutical and industrial proteins on a commercial scale.	**7&8**	a/2	b/2	c/1	d/1, d/3, d/4
Quality Management Systems: quality management systems are essential for the efficient and safe running of commercial and industrial biotechnology enterprises.	**9&10**	a/3	b/3	c/1	d/1, d/5, d/6
Bioremediation	**11&12**	a/2	b/4	c/1	d/1, d/4, d/5
Biotechnology Resources: Periodicals, Web Sites, General Science Journals Biotech Education & Careers	**13&14**	a/1, a/2, a/3	b/1, b/2	c/1, c/2	d/1, d/5, d/6

Course coordinator :Prof. Omima Khamis

Head of department: Prof. Haroun Abou Shama

Course Specifications

9. Course information:							
Course Code:	**A-25**	**Course Title:**	**Biotechnology in plant nutrition.**				
No. units	3	**Lec.**	3	**App.**	-	**Level**	M.Sc
Department	**Plant biotechnology**						

10. Course Aims	
	1-Demonstrating principles of soil fertility and plant nutrition. 2- Defining how plant grows and the elements essential for successful crop production. 3-Applying applications of Biofertilization in Egypt.

2- Intended Learning Outcomes of Course (ILO's)	
e. Knowledge and Understanding:	a/1- Describe Commercial use of Biofertilization agents: Status and prospects a/2- Classify the basic rules of The Commercial use of Biofertilization in Organic farms in Egypt. a/3- Summarize the fundamentals Biofertilization, Progress, Problems and potential. a/4- Describe the Physiological approaches to improve the ecological fitness of Biofertilization.
f. Intellectual skills:	b/1- Interpret the various types of fertilizers. b/2- Analyze the environmental risks, biological effects of toxicants, and genetic modified microorganisms in Biofertilization treatment. b/3- Plan to the methods of industrial pollution control, main concepts of food chemistry and toxicants, environmental qualities in lab and in field and environmental engineering processes
g. Professional Skills of course:	c/1- Apply the various methods of fertilization for evaluation of environmental risks, pollution in air,soil and water. c/2- Adjust plant biotechnology application for agricultural problems.

	c/3- Adjust the various Biofertilization methods to produce clean and high yield.
h. General and Transferable Skills	d/1- Work on compost formation. d/2- Appear administration skills Biofertilization, Progress, Problems and potential d/3- Appear self learning abilities in getting knowledge from data sources, text books and internet. d/4- Use different sources of information to obtain data for a given plantation technologies.. d/5- Use educational technology displaying devices for explain important modern techniques of presentation. d/6- Manage time effectively and work effectively in teamwork.

	3- Course Contents:
Week No.	**Topic**
1&2	Fertilizers, Progress, Problems and potential (*in vivo and in vitro*).
3&4	The Decomposition process and the environmental and agricultural benefits depending on using it.
5&6	Production, Stabilization and Formulation of compost formation.
7&8	Physiological approaches to improve the ecological fitness of the biofertilization agents.
9&10	The different mechanisms of biofertilizers affecting soil and plant nutrition.
11&12	Application of biofertilization .
13&14	The Commercial use of Biofertilization in Organic farms in Egypt.

4- Teaching and Learning Methods	
	1-Lectures 2- Practical classes. 3-Discussion sessions 4- Seminars. 5- Exercises

5- Teaching and Learning Methods (for students with special needs)	**Not applicable**

6- Student Assessment:	
d. Assessment Methods:	*Semester works, *Midterm exam, *Oral exam, *Written (Final) exam.
e. Assessment Schedule	* (5th&10th weeks), * (6th) Week, * (14th) Week, * (15th) Week.
f. Weighting of Assessments	10 degrees ratios 10%, 10 degrees ratios 10%, 20 degrees ratios 20 %, 60 degrees ratios 60% Total 100 degrees ratios 100%

7- List of References:	
a. Notes	- Lectures on plant biotechnology prepared by some of the professors in the department. - Computer presentations (CD and data show).
b. Essential Books (Text Books)	Roberta H. Smith (2000) Plant Tissue Culture Techniques And Experiments.Second Edition.Department of Soil and Crop Sciences Texas A and M University.College Station,Texas,USA. -Jones.J.B(2012)Plant nutrition and soil fertility manual 2nd .ed.
c. Suggested Books	B.Saraptka,J.Urban,Scizkova nd S.Hejduk(2009) Organic Agriculture.
d. Periodicals, Web Sites, … etc ...	

Course Coordinator: Dr. Khaled Almorsy Mazrou

Head of the department council: Dr. Haroun Abou Shama

Date:

Matrix of Knowledge, Skills ILOs for Biotechnology in plant nutrition. (A-25) course

Course Contents	Week No.	Knowledge and Understanding	Intellectual skills	Professional Skills of course	General and Transferable Skills
1- Fertilizers, Progress, Problems and potential (*in vivo and in vitro*).	**1&2**	**a1,a2,a3**	**b1,b2**	**c1,c2, c3**	**d1,d2, d3,d6**
2- The Decomposition process and the environmental and agricultural benefits depending on using it.	**3&4**	**a1,a2,a4**	**b1,b3**	**c1,c2, c3**	**d1,d2, d3,d6**
3 - Production, Stabilization and Formulation of compost formation.	**5&6**	**a1,a3**	**b1,b3**	**c1,c2, c3**	**d1,d2, d3,d6**
4- Physiological approaches to improve the ecological fitness of the biofertilization agents.	**7&8**	**a1,a2,a3**	**b1,b2, b3**	**c1,c2, c3**	**d1,d2, d3,d6**
5- The different mechanisms of biofertilizers affecting soil and plant nutrition.	**9&10**	**a1,a3,a4**	**b1,b2, b3**	**c1,c2, c3**	**d1,d3, d4d6**
6- Application of biofertilization.	**11&12**	**a1,a3,a4**	**b1,b2, b3**	**c1,c2, c3**	**d1,d2, d3,d6**
7- Application of biofertilization.	**13&14**	**a1,a2,a3**	**b1,b2, b3**	**c1,c2, c3**	**d1,d2, d5,d6**

Course Coordinator: Dr. Khaled Almorsy Mazrou

Head of the department council: Dr. Haroun Abou Shama

Date:

Course Specifications

11. Course information:							
Course Code:	A-35	**Course Title:**	**English Language**				
No. units	3	**Lec.**	2	**App.**	2	**Level**	M.Sc
Department	**Plant Biotechnology**						

12. Course Aims	
	1- Awarding Master graduate students with the fundamental knowledge of English language required to solve practical and theoretical problems in the research field. 2- Studying language science as talking, understanding of the main points of tutorial readings, and additional relevant information. 3- Dealing with the proper own conclusions about the opinion/argument/ thesis. 4- knowing the main divisions of the fundamental concepts of presentation topic, Observation; repetition, and pre-evaluation

13. Intended Learning Outcomes of Course (ILO's)	
i. Knowledge and Understanding:	a/1- Describe the basic English language skills as understanding, Talking, presentation and conversation. a/2- Summarize the basic rules of talking, demonstrating and understanding of the main points of tutorial readings. a/3- Divide the fundamentals of structuring the Oral Presentation. a/4- Summarize the fundamentals of Preparing handouts and visual aids; structuring the Oral Presentation. a/5- Clarify difference between various methods of preparation English articles.
	b/1- Distinguish methods for reading background materials. b/2- Derive the relationships between the various kinds of preparing and delivering presentations.

j. Intellectual skills:	b/3- Interpret the main points of tutorial readings, and additional relevant information.
k. Practical and Professional Skills of course:	c/1- Prepare remarks about observation; repetition, and pre-evaluation of other students in the English course. c/2- Select various methods for evaluation of different English skills c/3- Prepare various methods for reading background English materials. c/4- Adjust the various methods for preparation of presentations. c/5- Excute some different handouts and visual aids related to English language.
l. General and Transferable Skills	d/1- Use Internet to get knowledge from data sources, e.g., text books, scientific journals, internet, multimedia……etc. d/2- Read with Efficiency through different English articles. d/3- Appear self learning abilities in workshops and training courses. d/4- Use Application of Computer in the field of English course. d/5- Appear managements skills to manage scientific seminars and presentation. d/6- Work on team effectively. d/7- Use Audio & Video Means For Displaying Information.

	14. Course Contents:
No.	**Topic**
1	Introduction and definition of English language and its relation to the study of Genetic Engineering and Biotechnology (GEB).
2	Historical perspective of this study and the role of language as a means.
3	Scope and importance of (GEB) through language debates in lecture.
4	Describing experiments and their processes in language workshops inside lectures in two or more groups with commentary.
5	Suggesting paper handouts on topics such as: polymerase chain reaction, DNA profiling, human genome projects, and gene transfer technique.
6	Public perception of Biotechnology in Arab countries in general and Egypt in particular with

	anecdotes.
7	Unite operations and lab experiments description.

15. Teaching and Learning Methods	
	1- Presentations 2- Projector slides 3- Data show 4- Lectures

16. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

17. List of References:	
e. Essential Books (Text Books)	1- Cambridge Academic English B1+ Intermediate Student's Book

	2- Straightforward 2nd Edition Intermediate Student's Book 3- MyGrammarLab Intermediate with Answer Key and MyLab Pack 4- New Success Pre-Intermediate Teachers Book. 5- Gateway B2+ Student Book.
f. Periodicals, Web Sites, … etc ...	Kaplan's English Course Online English Game. headingtonoxfordsummerschool.co.uk *www.1-language.com*

Course coordinator : **Dr. Amir El-Komy**
Head of Department: **Prof. Haroun Abou Shama**

Matrix of Knowledge and skills of English language course

No.	Course topic	Week No.	Knowledge and understanding	Intellectual abilities	Professional and practical skills	General and transferable skills
1	Introduction and definition of English language and its relation to the study of Genetic Engineering and Biotechnology (GEB).	**1&2**	a/1, a/2	b/1	c/1	d/1, d/3,
2	Historical perspective of this study and the role of language as a means.	**3&4**	a/3	b/2	c/2	d/2
3	Scope and importance of (GEB) through language debates in lecture.	**5&6**	a/4, a/5	b/3	c/3, c/4	d/2, d/3
4	Describing experiments and their processes in language workshops inside lectures in two or more groups with commentary.	**7&8**	a/3	b/1, b/2	c/5	d/1, d/4
5	Suggesting paper handouts on topics such as: polymerase chain reaction, DNA profiling, human genome projects, and gene transfer technique.	**9&10**	a/4	b/3	c/1	d/2, d/5
6	Public perception of Biotechnology in Arab countries in general and Egypt in particular with anecdotes.	**11&12**	a/5	b/1	c/2	d/1, d/6
7	Unite operations and lab experiments description.	**13&14**	a/2	b/2	c/4, c/5	d/1, d/7

Course coordinator: **Dr. Amir El-Komy**
Head of Department: **Prof. Haroun Abou Shama**

Course Specifications

18. Course information							
Course Code:	**A-38**	**Course Title:**	**Fundamentals of plant propagation and micro-propagation**				
No. units	3	**Lec.**	3	**App.**		**Level**	**M.Sc.**
Department	**Plant biotechnology**						

19. Course Aims	
	1- Building Master Graduate show self-Learning abilities and able to continuation education & scientific research, having scientific research tools in the field of interest. 2- Preparing Master Graduate having capability of applying the basics and its different tools and able to formulate methodologies of scientific research in the field of interest. 3- Improving skills of the Master graduate in collect evidences of problems and appoint information for using available resources to solve them to achieving highest benefits in the field of interest. 4- Describing and preparing Master Graduate having capability of applying the basics and methodologies of scientific research using of its different tools in the field of plant biotechnology and relating interest.

20. Intended Learning Outcomes of Course (ILO's)	
m. Knowledge and Understanding:	a1- Express and recognize the basic rules of field crop biotechnology and methods of its evaluation, application and production. a2- Summarize and Know the general concept of agricultural biotechnology and its impact on environment and application a3- Describe and outline the general issues and application of plant biotechnology. a4-Describe and apply for the plant tissue experiments and its application for production of virus free plants. a5-Describe basic facts and theories of plant biotechnology, Biodiversity information, general issues and application of plant biotechnology and different analysis methods of plant natural products.

n. Intellectual skills:	b1- Interpret and link between the plant biotechnology and the application under Egyptian environment. b2- Compare and evaluate the biology methods of tissue culture. b3- Compare and Evaluate the plant tissue culture techniques. b/4 Analyze scientific researches to solve the problems of Research and Research Methodology.
o. Professional Skills:	c/1 Adjust and prepare the different formula for growth media of specific biological plant organs and different groups of fungi and bacteria. c/2 Apply the various methods for application of plant tissue culture. c/3 Measure and practice the different biological methods for plant disease control. c/4 Execute programs and methods for plant breeding and improvement through different ways.
p. General and Transferable Skills	d/1 Work effectively in a team. d/2 Acquire of self confidence and leadership skills . d/3 Participate in workshops and training courses. d/4 Learn independently and seek continuous learning in plant biotechnology.

	21. Course Contents:
No.	**Topics**
1	Introduction
2	*In vitro* propagation and medium components.
3	Micropropagation stages
4	Factors affecting *in vitro* propagation
5	Physiological disorder during *in vitro* propagation
6	Sexual reproduction
7	Asexual reproduction

22. Teaching and Learning Methods	

	Lectures Class activities Discussion Presentation Reports

23. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

24. List of References:	
g. Notes	**Hand out paper**
h. Essential Books (Text Books)	**-Trigiano, R.N.and Gray, D.G.(2000):** Plant tissue culture concepts and laboratory exercises. CRC Press, London. **-Kumar U. (2001)**: Methods in plant tissue culture. **-Narayanaswamy,S(2002):** Plant cell and tissue culture ..

i. Suggested Books	**-Wetherell, D.F.(1976):** Introduction to *in vitro* propagation **-Gamborg, O.L. and Phillips G.C. (1995):** Plant cell, tissue and organ culture.
j. Periodicals, Web Sites, … etc ...	

Course coordinator :Dr. Awatef Mahmoud Badrelden	
Head of the department council: Prof. Haroun Abou Shama	
Date:	

Matrix of Knowledge, Skills ILOs for Education Course: A-38 Fundamentals of plant propagation and micro-propagation

Course Contents	Week No.	a-Knowledge and Understanding	b- Intellectual skills	c- Professional Skills of course	d-General and Transferable Skills
Introduction	**1&2**	**a/1, a/2**	**b/2, b/3**	**c/1, c/2**	**d/3, d/4**
In vitro propagation and medium components.	**3&4**	**a/4, a/5**	**b/2, b/4**	**c/2, c/3**	**d/2, d/3**
Micropropagation stages	**5&6**	**a/3, a/4**	**b/2, b/3**	**c|3**	**d/2**
Factors affecting *in vitro* propagation	**7&8**	**a/1,a3**	**b/2, b/3**	**c|4**	**d/2, d/3**
Physiological disorder during *in vitro* propagation	**9&10**	**a/3, a/4**	**b/3, b/4**	**c|3, c|4**	**d/4**
Sexual reproduction	**11&12**	**a/1, a/4**	**b/1**	**c|3, c|4**	**d/1, d/3**
Asexual reproduction	**13&14**	**a/3, a/4**	**b/4**	**c|3, c|4**	**d/1, d/2,d/3**

Course coordinator :Dr. Awatef Mahmoud Badrelden	
Head of the department council: Prof. Haroun Abou Shama	
Date:	

Course Specifications

25. Course information:							
Course Code:	**A-65**	**Course Title:**	**Physiology of Plant Growth Regulators**				
No. units	3	**Lec.**	3	**App.**		**Level**	MSc
Department	**Plant Biotechnology**						

26. Course Aims	
1- Providing students with the fundamentals terms and concepts, methodology for extraction, purification and determination of Plant growth substances. 2- Introducing students with chemistry, mechanism of action and biological effects of auxin, cytokinins, and gibberellins. 3- Enhancing students' knowledge about growth inhibitors, growth and retardants and their application.	

27. Intended Learning Outcomes of Course (ILO's)	
q. Knowledge and Understanding:	a/1 Describe basic rules of plant hormones and growth regulators a/2 Describe understanding the fundamentals of plant hormones and growth regulators and its application a/3 Summarize outline the general issues and application of plant growth retardants and inhibitors. a/4Outline the general issues and application of plant hormones and growth regulators
r. Intellectual skills:	b/1 Compare the various types of hormones and growth regulators . b/2 Analyze and explain how crop plants developed and the role of plant hormones and growth regulators b/3 Explain the plant growth retardants, inhibitors and its application b/4 Solve specialized problems according to available data.
s. Professional Skills of course:	c/1 Apply the plant hormones and growth regulators for improving the high yield. c/2 Apply the various methods for application of plant hormones and growth regulators c/3 Apply the various methods for application of plant growth retardants and inhibitors

	c/4 Write & evaluate professional reports
t. General and Transferable Skills	d/1Practice self appraisal and determines his learning needs. d/2 Use different sources of information to obtain data for a given course topics. d/3 Use information technology to improve his professional practice in internet and relative information. d/4 Work as team leader in situation comparable to his level.

No.	Topic
1	Fundamentals Terms and Concepts, Methodology for Extraction, Purification and Determination of Plant Growth Substances.
2	Chemistry of Auxin, Cytokinins, Gibberellins
3	Mechanism of Action of Auxin, Cytokinins, Gibberellins
4	Biological effects of Auxin, Cytokinins, Gibberellins
5	Growth inhibitors
6	Growth and retardants
7	Application of growth inhibitors and growth retardants

28. Teaching and Learning Methods	
	Lectures **Class activities** **Discussion** **Presentation** **Reports**

29. Teaching and Learning Methods (for students with special needs)	**Not applicable**

7. Student Assessment:	
g. Assessment Methods:	• **Semester works,** • **Midterm exam,** • **Oral exam,** • **Written (Final) exam.**

h. Assessment Schedule	• **5th & 10th works,** • **6th weeks,** • **14th weeks** • **15th weeks.**
i. Weighting of Assessments	• **10 degrees** • **10 degrees** • **20 degrees** • **60 degrees** • **Total 100 degrees**

30. List of References:	
k. Notes	-----
l. Essential Books (Text Books)	**-William G.Hopkins and Norman P. A. Hiiner (2004)**: Plant physiology **-Verma S.K. 2010:** Plant physiology**,** Biochemistry and biotechnology**.**
m. Suggested Books	**Verma SK, Verma M.(1995):**Plant physiology, biochemistry and biotechnology
n. Periodicals, Web Sites, … etc ...	**Plant cell report, plant science**

Course coordinator : **Dr. Awatef Mahmoud Badrelden**
Head of the department: **Prof. Dr. Haroun Abou Shama**
Date:

Matrix of Knowledge, Skills ILOs for Education Cousrse: A-65 Physiology of Plant Growth Regulators

Course Contents	Week No.	a-nowledge and Understanding	b-Intellectual skills	c-Professional Skills of course	d-General and Transferable Skills
Fundamentals Terms and Concepts, Methodology for Extraction, Purification and Determination of Plant Growth Substances.	1&2	a /1,2	b /4	1c	3d
Chemistry of Auxin, Cytokinins, Gibberellins	3&4	a /1,2	b /1,2,4	c /1,4	d /2,3,4
Mechanism of Action of Auxin, Cytokinins, Gibberellins	5&6	a/1,2,3	b /2,4	c /2,4	d /1,2,3,4d
Biological effects of Auxin, Cytokinins, Gibberellins	7&8	a /2,4	b /2,4	c /2,4	d /2,4d
Growth inhibitors	9&10	a /3	b /3,4	c /3,4	d /1,2,3,4d
Growth and retardants	11&12	a /3	b /3,4	c /3,4	d /1,2,3,4
Application of growth inhibitors and growth retardants	13&14	a /3	b/3,4	c /3,4	d /1,2,3,4

Course coordinator : Dr. Awatef Mahmoud Badrelden

Head of the department: Prof. Dr. Haroun Abou Shama

Date:

Course Specifications

31. Course information:							
Course Code:	**A-66**	**Course Title:**	**Plant biotechnology**				
No. units	3	**Lec.**	3	**App.**		**Level**	MSc
Department	**Plant Biotechnology**						

32. Course Aims	2/1 introducing students to understand the concept of plant biotechnology and the principles, practices and application of plant tissue culture and transformation in science, agriculture and industry. 2/2 acquainting students with experimental design and analysis of plant biotechnology experiments. 2/3 giving students hands-on experience and training in representative plant tissue culture and genetic engineering techniques. 2/4 exposing students to issues and challenges encountered in the area of plant biotechnology.

3. Intended Learning Outcomes of Course (ILO's)	
u. Knowledge and Understanding:	a/1 Express the techniques of plant tissue culture, micropropagation and plant regeneration via organogenesis and somatic embryogenesis. a/2 Classify the application and benefit of plant biotechnology techniques and express various aspects of plant biotechnology a/3 Describe concept of plant biotechnology and summarize the technology of plant quality and crop improvement a/4 Divide the methods of genetic improvement of plants through somatic hybridization, genetic transformation and molecular markers and farming.
v. Intellectual skills:	b/1 derive how plant improved and enhanced using tools of plant biotechnology. b/2 Compare among different methods of somatic hybridization, genetic transformation and molecular markers and farming. b/3 Plan and to produce regenerate and manipulate plants starting from single cell or tissue.

w. Professional Skills:	c/1 Implement tasks at a professional level to solve problems related to the discipline and write a report on an independent practical project c/2 Execute a variety of experimental procedures in the laboratory, form and devise experimental methods appropriate for tackling a particular problem.
x. General and Transferable Skills:	d/1 Use of IT (word processing, spreadsheets and databases, web sources) and communicate scientific ideas d/2 Give oral presentations and work as part of a team and use library resources and manage time

	4. Course Contents:
No.	**Topic**
1	Principle of plant tissue culture and the basic requirements for aseptic conditions and roles of growing media and plant growth regulators for micropropagation
2	*In vitro* growth and development of plant culture and plant tissue culture for commercial production: Organogenesis and somatic embryogenesis.
3	Biosynthesis of plant products
4	Methods in plant molecular biology
5	Plant genetic transformation
6	Molecular farming
7	Molecular marker

5. Teaching and Learning Methods	1. Lectures 2. Data show 3. Scientific Journals 4. Text books

6. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:

a. Assessment Methods:	• Semester works, • Midterm exam, • Oral exam, • Written (Final) exam.
b. Assessment Schedule	• 5th & 10th works, • 6th weeks, • 14th weeks • 15th weeks.
c. Weighting of Assessments	• 10 degrees • 10 degrees • 20 degrees • 60 degrees • Total 100 degrees

h. List of References:	
o. Notes	-
p. Essential Books (Text Books)	1. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice. 2004 2. Chawla, H.S. Introduction to plant biotechnology. 2nd Edition. USA. Science Publisher. 2002.
q. Suggested Books	1. Crispeels, M.J. and Sadava, D.E., Plants, Genes and Crop Biotechnology, Jones and Bartlett Publishers (2nd Edition), 2003. 2. Gupta, P.K., "Elements of Biotechnology", Rastogi Publication
r. Periodicals, Web Sites, … etc ...	-

Course coordinator : **Dr. Yehia Khidr**
Head of the department: **Prof. Haroun Abou Shama**

Matrix of Knowledge, Skills ILOs for Education Cousrse of Plant Biotechnology (A-66)

Course Contents	Week No.	a-Knowledge and Understanding	b-Intellectual skills	c Professional Skills of course	d-General and Transferable Skills
Principle of plant tissue culture and the basic requirements for aseptic conditions and roles of growing media and plant growth regulators for micropropagation	1&2	a/1,3	b/1, 3	c/1, c/2	d/1, d/2
In vitro growth and development of plant culture and plant tissue culture for commercial production: Organogenesis and somatic embryogenesis.	3&4	a/1,3	b/1, 3	c/1, c/2	d/1, d/2
Biosynthesis of plant products	5&6	a/2,3	b/1, 3	c/1, 2	d/1, 2
Methods in plant molecular biology	7&8	a/2,3	b/1, 2	c/1, 2	d/1, 2
Plant genetic transformation	9&10	a/2,3,4	b/1, 2	c1, 2	d/1, 2
Molecular farming	11&12	a/2,3,4	b/1, 2	c/1, 2	d/1, 2
Molecular marker	13&14	a/2,3,4	b/1, 2	c/1, 2	d/1, d2

Course coordinator : **Dr. Yehia Khidr**
Head of the department: **Prof. Haroun Abou Shama**

Department: **Plant Biotechnology**

Course Specifications

33. Course information:							
Course Code:	B3-1	**Course Title:**	**Advanced plant breeding I**				
No. units	3	**Lec.**	3	**App.**		**Level**	M.Sc.,
Department	**Plant Biotechnology**						

34. Course Aims	
	Discussion of reproductive systems of higher plants; the genetic basis for plant improvement and the selection, evaluation, and utilization of crop varieties.

35. Intended Learning Outcomes of Course (ILO's)	
y. Knowledge and Understanding:	a1) Recognize the basic rules of plant tissue culture, plant pathology, plant breeding, biotechnology of secondary products, breeding of disease-resistant plants, plant physiology, biotechnology of field, horticulture, vegetable and ornamental crops, and mushroom propagation. a2) Know the basic rules of plant breeding science, technology and molecular breeding and its biological impacts and genetic application. a3) Know the basics of breeding to insect resistance, stresses resistance and tolerance, especially the molecular breeding, genetic protection, gene technology and population biology
z. Intellectual skills:	b1) Discuss the different methods of plant breeding and its application. b2) Suggest programs for breeding to produce plants resistant or tolerant to different stresses, biotic or abiotic.
aa. Professional Skills of course:	c1) Perform laboratory and field tests for molecular markers for plant breeding. C2) Apply the genetic modified plants for improving the

	high yield and plant disease and insect resistances.
bb. General and Transferable Skills	d1) Collect the knowledge from data sources, e.g., text books, scientific journals, internet, multimedia……etc. d2) Acquire of self confidence and leadership skills. d3) Work effectively in teamwork. d4) Create thinking skills through analysis of data. d5) Experience in the plant biotechnology, transformation, breeding and crop evolution.

	36. Course Contents:
No.	**Topic**
1	Sciences related to plant breeding**,** History of Plant Breeding as Art & Science
2	Reproduction in crop plants, types of reproduction, determine of mode of reproduction
3	Plant genetic resources, origin, conservation, and utilization
4	Genetic basis and application of selection in self pollinated crops**,** Mendlian consequences of planned hybridization in self pollinated crops
5	Quantitative inheritance**,** The analysis of genotype environment interaction**,** Pedigree methods
6	Bulk population breeding method**,** The single seed descent method
7	Genetic basis of heterosis, Polyploidy in plant breeding

37. Teaching and Learning Methods	
	Theoretical lectures Practical works Lab experiments Scientific trips

38. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.

b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.	
c. Weighting of Assessments	10degrees	Ratios 10%,
	10 degrees	Ratios 10%,
	20 degrees	Ratios 20%,
	60 degrees	Ratios 60%,
	Total 100 degrees	Ratios 100%.

39. List of References:	
s. Notes	Lectures written by course coordinator(s)
t. Essential Books (Text Books)	Fehr. W.R., Principles of cultivar development. Vol. 1. Theory and technique. (ed.) 2- Quantitative genetics in maize breeding. A.R. Hallauer and J.B. Miranda, FO.
u. Suggested Books	Singh, B. D., Plant Breeding
v. Periodicals, Web Sites, … etc ...	Plant Breeding J., Crop Science J., Plant Breeding, Theoretical & Applied Genetic, Genome, Cereal Research communication

Course coordinator : **Dr. Khaled F. M. Salem**
Head of the department council: **Prof. Haroun Abou SHama**
Date:

Matrix of Knowledge and skills of the educational course targeted Course Advanced plant breeding I B3-1

Contents	Week No.	a- Knowledge and Understanding	b- Intellectual skills	c- Professional Skills	d- General and Transferable Skills
Sciences related to plant breeding, History of Plant Breeding as Art & Science	1&2	a/1	b/1	-	d/1,2
Reproduction in crop plants, types of reproduction, determine of mode of reproduction	3&4	a/1	b/2	c/1	d/2,3
Plant genetic resources, origin, conservation, and utilization	5&6	a/3	b/2	c/2	d/1
Genetic basis and application of selection in self pollinated crops, Mendlian consequences of planned hybridization in self pollinated crops	7&8	d/1	b/1	c/1	d/2,5
Quantitative inheritance, The analysis of genotype environment interaction, Pedigree methods	9&10	d/3	b/1	c/1	d/3,4
Bulk population breeding method, The single seed descent method	11&12	d/3	b/2	c/1	d/1,3
Genetic basis of heterosis, Polyploidy in plant breeding	13&14	d/1	b/2	c/2	d/2,4

Course coordinator : **Dr. Khaled F. M. Salem**
Head of the department council: **Prof. Haroun Abou Shama**
Date:

Department: **Plant Biotechnology**

Course Specifications

40. Course information:							
Course Code:	**B3-10**	**Course Title:**	**Biotechnology of secondary metabolites**				
No. units	**3**	**Lec.**	**3**	**App.**	**-**	**Level**	**MS.c**
Department	**Plant Biotechnology**						

41. Course Aims	
	1- Transferring the most updated skills and technologies in the area of secondary metabolites production, via in vivo and /or in vitro. 2- Enhancing students and researches capabilities and storming their knowledge, intellectual and practical skills. 3- Attaining the importance of various factors affecting plant secondary metabolites production. 4- Appointing information to link between secondary metabolites production, extraction and various methods of chemical analysis.

42. Intended Learning Outcomes of Course (ILO's)	
cc.Knowledge and Understanding:	a1- Summarize the basic theories of secondary products biosynthesis and recognize the basic rules of biotechnology of secondary metabolites. a2- Classify the different methods of production and analysis of secondary metabolites. a3- Divide the fundamentals of plant cell, tissue and organ culture and its application in plant propagation and production of secondary metabolites. a4- Express the most important scientific term in secondary products field.

dd. Intellectual skills:	b1- Compare between the general issues and application of plant biotechnology. b2- Derive information to evaluate the biological methods, affecting secondary metabolites production b3- Interpret methods of natural products by using different chemical methods. b4- Analyze, determine and prioritize problems in the field of secondary metabolites biotechnology.
ee.Professional Skills:	c1- **Measure** and analyze data of different experiments in field of plant tissue culture.
ff. General and Transferable Skills	d1- Use internet to collect the knowledge from data sources, e.g., text books, scientific journals, ….etc d2- Appear management skills to acquire of self confidence and leadership skills d3-Use audio & video means for displaying information Organize and manage scientific seminars and presentation d4- Appear self-learning and distance learn capabilities in secondary metabolites biotechnology field.

	43. Course Contents:
No.	**Topic**
1	Introduction of secondary metabolites and plant tissue culture. Hypotheses of secondary metabolite formation
2	Production of secondary metabolites via different biotechnology techniques.
3	Factors affecting secondary metabolites production.
4	Enhancement of secondary metabolites production.
5	The storage of plant cell culture and its effect on metabolites.
6	Extraction and chromatographically methods of secondary metabolites.
7	Topics in plant biotechnology of secondary metabolites. (Student's presentation)

44. Teaching and Learning Methods	
	- Lectures - scientific seminars and presentation - Students activity -Discusion / Reports

45. Teaching and Learning Methods (for students with special needs)	**Not applicable**

7. Student Assessment:			
a. Assessment Methods:	* Oral exam, * Written (Final) exam.		
b. Assessment Schedule	*Semester works 5th &10th works, *Mid term 8th week, * Written exam 16th week, *Oral exam 16th week.		
c. Weighting of Assessments	Oral exam Semester work Written exam Total	20 degrees 20 degrees 60 degrees 100 degrees	Ratios 20%, Ratios 20%, Ratios 60%, Ratios 100%.

8. List of References:	
w. Notes	-
x. Essential Books (Text Books)	-Hand Book of Medicinal herbs (2002) CRC Press LLC -2- Medicinal plant biotechnology (2007) WILEY-VCH Verlag GmbH & Co.
y. Suggested Books	- Medicinal Natural products (2002) by John Wiley & Sons Ltd - Studies in natural product chemistry (2001) ELSEVIER
z. Periodicals, Web Sites, … etc ...	- Natural products - Plant cell report, - Phytochemistry - Phytotherapy journal -In Vitro Cell.Dev.Biol.---plant - Records of natural products - Plant,cell, tissue and organ culture -http://en.wikipedia.org/wiki

Course coordinator : **Dr. Metwally Hassan**

Head of the department: **Prof. Haroun Abou Shama**

University of Sadat City
Genetic Engineering and
Biotechnology Research Institute.
Quality Assurance and Continuous
Improvement Unit

جامعة مدينة السادات
معهد بحوث الهندسة الوراثية والتكنولوجيا الحيوية
وحدة ضمان الجودة والتطوير المستمر

Matrix of Knowledge and skills of the educational course targeted

Course name: Biotechnology of secondary metabolites (B3-10)

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1	Introduction of secondary metabolites and plant tissue culture. Hypotheses of secondary metabolite formation	a/1,4	b/1	-	d/1
2	Production of secondary metabolites via different biotechnology techniques.	a/2	b/2	c1	d/1
3	Factors affecting secondary metabolites production.	a/1	b/2	-	d/2
4	Enhancement of secondary metabolites production.	a/2	b/2	-	d/3
5	The storage of plant cell culture and its effect on metabolites.	a/3	b/1	-	d/1
6	Extraction and chromatographically methods of secondary metabolites.	a/2	b/3,4	-	d/1
7	Topics in plant biotechnology of secondary metabolites. (Student's presentation)	a/3	b/1	-	d/1,3,4

Course coordinator : **Dr. Metwally Hassan**

Head of the department council: **Prof. Horoun Abou Shama**

Date

Department: **Plant Biotechnology**

Course Specifications

46. Course information:							
Course Code:	**B3-20**	**Course Title:**	**Field crop biotechnology-1**				
No. units	**3**	**Lec.**	**3**	**App.**		**Level**	**M.Sc**
Department	**Plant Biotechnology**						

47. Course Aims	
	2/1 introducing students to the basic information about field crop biotechnology 2/2 acquainting students with experimental design and analysis of plant biotechnology experiments. 2/3 giving students with the applications of field crop biotechnology and its uses and to develop the laboratory skills of students on plant biotechnology.

48. Intended Learning Outcomes of Course (ILO's)	
gg. Knowledge and Understanding:	a/1 Express the concept and applications of plant cell and tissue culture. a/2 Summarize genetic transformation techniques. a/3 Describe the application of plant biotechnology for crop improvement a/4 Describe the theories and application of molecular techniques a/5 Divide various aspects of Post-transcriptional gene silencing (PTGS) and its application and DNA-based molecular markers and their application.
hh. Intellectual skills:	b/1. Compare between gene silencing and post-transcriptional gene silencing, genomic Library and cDNA Library. b/2. Plan to solve problems plant diseases and abiotic stresses by genetic transformation techniques and molecular markers. b/3. Analyze mode of action of restriction enzymes. b/4. Interpret the mechanism of PTGS and derive application of plant tissue culture in plant biotechnology and crop improvement.

ii. Professional Skills of course: -	c/1 Apply, or adapt, practical instructions safely and accurately c/2 Execute a variety of experimental procedures in the laboratory. c/3 Form and devise experimental methods appropriate for tackling a particular problem
jj. General and Transferable Skills	d/1) Collect the knowledge from data sources, e.g., text books, scientific journals, internet, multimedia…etc d/2) Acquire of self confidence and leadership skills, Self-learn and distance learn capabilities.

49. Course Contents:	
No.	**Topic**
1	Crop biotechnology and its scope. Plant cell, tissue and organ culture.
2	Elementary idea of theory and application of molecular techniques.
3	Gene silencing and post-transcriptional gene silencing (PTGS). Biofertilisers and bioinsecticides.
4	Restriction enzymes. Vectors and gene cloning.
5	Libraries and molecular probes. Polymerase chain reaction (PCR).
6	Methods of gene transfer in plants. Transgenic plants in dicots and monocots.
7	A brief idea of DNA-based molecular markers and their application.

50. Teaching and Learning Methods	
	1. Data show 2. Scientific Journals 3. Text books 4. Internet

51. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week,

	* 15th week.	
c. Weighting of Assessments	10degrees 10 degrees 20 degrees 60 degrees Total 100 degrees	Ratios 10%, Ratios 10%, Ratios 20%, Ratios 60%, Ratios 100%.

8. List of References:	
aa. Essential Books (Text Books)	1. Gupta, P. K. (2004). Biotechnology and Genomics. Rastogi Publications, Meerut 2. Joshi, P. (2002). Genetic Engineering and Its Applications. Agrobios (India), Jodhpur 3. Trivedi, P. C. (2000). Plant Biotechnology: Recent Advances. Panima Publishing Corporation, New Delhi 4. Chawla, H. S. (2000). Introduction to Plant Biotechnology. Oxford & IBH Publishing CO. Ltd., New Delhi 5. Lorz, H. and Wenzel, G. (2004). Biotechnology in Agriculture and Forestry. Springer-Verlag 10. Oksman-Caldentey, K. M. and Barz W.H. (2006) Plant Biotechnology and Transgenic Plants. Plant Biotechnology Book from C.H.I.P.S., USA Halford, N. (2006) Plant Biotechnology: Current and Future Applications of Genetically Modified Crops. AgritechPublications, NY, USA.
10. Periodicals, Web Sites, … etc ...	• Crop Science • Plant biotechnology

Course Coordinator :	**Dr. Yehia Abd-Allah Khidr**
Head of the department council:	**Prof. Haroun Abou Shama**

Matrix of Knowledge and skills of the educational course targeted
Course name: Field crop biotechnology (B3-20)

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1	Crop biotechnology and its scope. Plant organ, tissue and cell culture.	a/1,2	b/4	c/1,2	d/1,2
2	Elementary idea of theory and application of molecular techniques.	a/3	b/1,2	c/1,2	d/1
3	Post-transcriptional gene silencing (PTGS). Biofertilisers and bioinsecticides.	a/4	b/1	c/1,3	d/1,2
4	Restriction enzymes. Vectors and gene cloning.	a/2	b/3	c/1,2	d/2
5	Libraries and molecular probes. Polymerase chain reaction (PCR).	a/2	b/1	c/2,3	d/2
6	Methods of gene transfer in plants. Transgenic plants in dicots and monocots.	a/1,2	b/2	c/1	d/1
7	A brief idea of DNA-based molecular markers and their application.	a/4,5	b/2	c/1,2	-

Course Coordinator :	**Dr. Yehia A. Khidr**
Head of the department council:	**Prof. Haroun Abou Shama**

Department: **Plant Biotechnology**

Course Specifications

52. Course information:							
Course Code:	**B3-26**	**Course Title:**	**Genetics and cytogenetics in crops**				
No. units	**3**	**Lec.**	**3**	**App.**		**Level**	**MSc**
Department	**Plant Biotechnology**						

53. Course Aims	
	2/1 introducing the fundamentals of genetics and cytogenetics. 2/2 investigating the basic laws of chromosome structure, number, chromosome aberrations, and sex linked chromosomes and inherited. 2/3 acquainting students with knowledge of extra chromosomal inheritance and the mode of reproduction in plants, particularly apomixis, as well as the molecular basis of heredity, genomic in situ hybridization 2/4 exposing students to issues and challenges encountered in the classical and molecular methods of genome analysis. The cytogenetic basis of somaclonal variation generated through cell and tissue culture.

54. Intended Learning Outcomes of Course (ILO's)	
kk. Knowledge and Understanding:	a/1 Describe the basic of Genetics and Cytogenetics in crop plants. a/2 Classify the genetic variability with emphasis on interrelationships of cytological and genetic concepts. a/3.Express various aspects of classical and modern techniques in the handling of chromosomes, karyotype analysis, genetics of meiosis, genomic relationships, and chromosome manipulation
ll. Intellectual skills:	b/1 Plan, conduct and write report on Handling of plant

	chromosomes. b/2. Analyze Karyotyping of plant chromosomes. b/3. Interpret and evaluate changes in chromosome number and structure
Professional Skills:	c/1 apply, or adapt, practical instructions safely and accurately c/2 Execute a variety of experimental procedures in the laboratory. c/3 Form and devise experimental methods appropriate for tackling a particular problem c/4 Interpret quantitatively the results of experiments undertaken by themselves or others
mm. General and Transferable Skills	d/1 make use of IT (word processing, spreadsheets and databases, web sources) and communicate scientific ideas d/2 give oral presentations and work as part of a team d/3 use library resources and manage time

55. Course Contents:	
No.	**Topic**
1	Introduction to course strategic goals and objectives. Handling of plant chromosomes.
2	Handling of plant chromosomes. Cell division: Mitosis and Meiosis
3	Genetic control of meiosis
4	Mode of reproduction in plants
5	Karyotype analysis
6	Chromosomal aberrations – structural chromosome changes. Chromosomal aberrations – numerical chromosome changes
7	Genome analysis. Chromosomal Aberrations in Cell and tissue culture

56. Teaching and Learning Methods	
	5. Data show 6. Scientific Journals 7. Text books 8. Internet

57. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:

a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

58. List of References:	
bb. Essential Books (Text Books)	1. Principles and Methods in Plant Molecular Biology, Biochemistry and Genetics/Prathibha Devi. Jodhpur, 2000, 253 p. 2. Methods in Plant Molecular Biology and Biotechnology. Bernard R. Glick and John E. Thompson (eds.). CRC Press, Boca Raton, FL. 1993. 360 pp. ISBN 0-8493-5164-2. 1. Methods in Plant Molecular Biology: A Laboratory Course Manual 1995 • 446 pp. ISBN 0-87969-386-X
cc. Periodicals, Web Sites, … etc ...	• Crop Science • Plant Breeding • TAG • Genome

Course Coordinator : **Dr. Yehia A. Khidr**
Head of the department council: **Prof. Haroun Abou Shama**

Matrix of Knowledge and skills of the educational course and ILO's targeted
Course name: Genetics and cytogenetics in crops (B3-36)

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1	Introduction to course strategic goals and objectives. Handling of plant chromosomes.	a/1	b/1	c/1,2	d/1
2	Handling of plant chromosomes. Cell division: Mitosis and meiosis	a/2	b/1	c/2,3	d/2
3	Genetic control of meiosis	a/3	b/1	c/1,4	d/1
4	Mode of reproduction in plants	a/1	b/1	c/2,4	d/2
5	Karyotype analysis	a/3	b/2	c/1,3	d/1
6	Chromosomal aberrations – structural chromosome changes. Chromosomal aberrations – numerical chromosome changes	a/3	b/3	c/2,3	d/2
7	Genome analysis. Chromosomal aberrations in cell and tissue culture	a/3	b/3	c/4	d/3

Course Coordinator :	**Dr. Yehia A. Khidr**
Head of the department council:	**Prof. Haroun Abou Shama**

Department: Plant Biotechnology

Course Specifications

Course information:							
Course Code:	B3-31	**Course Title:**	**Hydroponics**				
No. units	3	**Lec.**	3	**App.**	_	**Level**	MSc
Department	**Plant Biotechnology**						

Course Aims	
1-Qualify the preeminent scientific staff (post- graduate students and researches) in both academic and applied field able to handing with the changeable requirements of the field of plant biotechnology. 2-Enhance students and researches capabilities and storming their intellectual and practical skills. 3-Transfer the most updated skills and technologies in the area of plant technology to the scientific staff via accomplishment of workshops, meeting and conferences. 4- Applying analytical methods & specialized knowledge and using appropriate technological means in hydroponics systems. .	

3. Intended Learning Outcomes of Course (ILO's)	
a. Knowledge and Understanding:	a/1 Express and recognize the basic rules of hydroponics technology and methods of its evaluation and application. a/2 Summarize and Know the general concept of hydroponics biotechnology and its impact on environment and application a/3 Ethical and legal Principals for professional practice in the field of plant culture a/4 Describe outline the general issues an application of hydroponics a/5 Summarize fundamental hydroponics and its use in plant improvements against insects and plant diseases, plant cell, tissue and organ culture and its application for plant propagation.

b. Intellectual skills:	b/1 Comprehend the general issues and application of differnent systems of hydroponics b/2 Link between the hydroponics systems and the application under Egyptian environment b/3 Analyze & Evaluate the information in the field of hyroponics system and Measuring it for solving problems b/4 Interpret different information to solve the problems of different nutrition and propagation.
c. Professional Skills:	c/1 Evaluate & develop methods & tools based on the field of contrrol systems
	c/2Apple the various methods of propagation through hydroponics systems c/3 Write professional reports related hydroponics and culture mrthods c/4 Prepare technical reports and scientific essay
d. Transferable Skills	d/1 Acquire of self confidence and leadership skills d/2 Organize and manage scientific seminars and presentation d/3 Work effectively in teamwork d/4 Work in teams and manage time effectively.

	Course Contents:
No.	**Topic**
1	**Introduction in hydroponics**
2	**Types of hydroponics**
3	**Culture methods**
4	**Plant growth effects and plant testes**
5	**Controlling system**
6	**Culture and cultivation**
7	**Some future aspects**

5. Teaching and Learning Methods	
	Lectures **Class activities** **Discussion** **Presentation** **Reports**

6. Teaching and Learning Methods (for students with special needs)	**Not applicable**

Student Assessment:	
Assessment Methods:	Semester works, Midterm Exam Oral exam Written (Final exam)
Assessment Schedule	• 5^{th}&10^{th} Works ● (6^{th}) Week, ● (14^{th}) Week ● (15^{th}) Week.
Weighting of Assessments	10 degrees 10 % ratios 10 degrees 10 % ratios 20 degrees 20 % ratios 60 degrees 60 % ratios Total 100 degrees 100 % ratios

8. List of References:	
a. Notes	-----
b. Essential Books (Text Books)	**Schwarz M. 1995.**Soilles culture management
c. Suggested Books	**-Jones, J. B., Jr. 1983.** A Guide for the Hydroponic
	and Soilless Culture Grower. Portland, OR: Timber Press. **-Ingratta, E J. 1979**. "Soilless culture ofgreenhouse vegetables." Agdex 290/5 18. Ontario, Canada: Ontario Ministry of Agriculture.
d. Periodicals, Web Sites, … etc ...	**Acta horticulture, Plant soil, Bajaj groups**

Course coordinator: Dr. Awatef Mahmoud Badrelden
Head of Department Prof. Haroun Abou Shama

Matrix of Knowledge and skills of the educational course targeted

Course name: Hydroponics (B3-31)

Contents	Week No.	a-Knowledge and Understanding	b-Intellectual skills	c-Practical and Professional Skills of course	d-General and Transferable Skills
1-Types of hydroponics	1&2	a/1, a/2	b/1, b3	c/1, c/2	d/2, d/3
2-Nutrition mixed fertilization	3&4	a/1, a/2	b/1, b/2	c/1, c/2, c/4	d/3,d4
3-Culture methods	5&6	a/1, a/2, a/3	b/1, b/2, b/3	c/1, c/2, c/4	d/1, d/2, d/3
4-Plant growth effects and plant testes	7&8	a/3, a/4	b/3, b/4	c/1, c/4	d/1, d/2, d/3
5-Controlling system	9&10	a/1, a/2	b/1, b/2	c/1, c/2, c/3	d/1, d/2, d/3
6-Culture and cultivation	11&12	a/2,a/4			
7-Some future aspects	13&14	a/5			

Course coordinator: Dr. Awatef M .Badrelden and Dr. Ahmed Nower

Head of Department Dr. Haroun Abou Shama

Department: **Plant Biotechnology**

Course Specifications

59. Course information:							
Course Code:	B3-33	**Course Title:**	**Methods of plant breeding**				
No. units	3	**Lec.**	3	**App.**		**Level**	M.Sc.,
Department	**Plant Biotechnology**						

60. Course Aims	
	- Overviewing of plant breeding methods for advanced undergraduate and beginning graduate students. - Covering principles and concepts of inheritance, germplasm resources, pollen control, measurement of genetic variances and heterosis. - Special topics including heritability, genotype-environment interaction, disease resistance, and polyploidy. In-depth coverage on methods for breeding cross pollinated and self-pollinated crops. Prepares students for advanced plant breeding courses.

61. Intended Learning Outcomes of Course (ILO's)	
nn. Knowledge and Understanding:	a1) Recognize the basic rules of plant tissue culture, plant pathology, plant breeding, biotechnology of secondary products, breeding of disease-resistant plants, plant physiology, biotechnology of field, horticulture, vegetable and ornamental crops, and mushroom propagation. a2) Know the basic rules of plant breeding science, technology and molecular breeding and its biological impacts and genetic application.
oo. Intellectual skills:	b1) Discuss the different methods of plant breeding and its application.
pp. Professional Skills:	c1) Perform laboratory and field tests for molecular markers for plant breeding. c3) Apply the genetic modified plants for improving the high yield and plant disease and insect resistances.
qq. General and Transferable	d1) Acquire of self confidence and leadership skills.

Skills	d2) Organize and manage scientific seminars and presentation. d3) Self-learn and distance learn capabilities. d4) Participate in workshops and training courses. d5) Experience in the plant biotechnology, transformation, breeding and crop evolution.

	62. Course Contents:
No.	**Topic**
1	What is a cultivar**,** Breeding methods in self pollinated crops
2	Selection procedures following hybridization**,** Back cross breeding
3	How breeding procedures for self pollinated crops the utilized & breeding cross pollinated and clonally propagated crops**,** Genetic structure of cross pollinated crops
4	Breeding seed propagated cross pollinated crops**,** Breeding clonally propagated are utilized & breeding hybrid cultivars
5	The origin of hybrid breeding**,** Inbreeding in cross pollinated crops
6	Hybrid vigor or Heterosis**,** Breeding single cross hybrid cultivars
7	Breeding objectives and techniques

63. Teaching and Learning Methods	
	Theoretical lectures, Practical works Lab experiments, Scientific trips

64. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.

c. Weighting of Assessments	10degrees	Ratios 10%,
	10 degrees	Ratios 10%,
	20 degrees	Ratios 20%,
	60 degrees	Ratios 60%,
	Total 100 degrees	Ratios 100%.

65. List of References:	
dd. Notes	Lectures written by course coordinator(s)
ee. Essential Books (Text Books)	J.M. poehlma & D. Borthakur, Breeding field crops
ff. Suggested Books	Singh, B. D., Plant Breeding
gg. Periodicals, Web Sites, … etc ...	Plant Breeding J., Crop Science J., plant biotechnology, Euphytica, Crop science and Biotechnology

Course coordinator : **Dr. Khaled F. M. Salem**
Head of the department council **Prof. Haroun Abou Shama**

Date:

Matrix of Knowledge, Skills ILOs for Education Cousrse: B3-33 Methods of plant breeding

Course Contents	Week No.	a-nowledge and Understanding	b-Intellectual skills	c-Professional Skills of course	d-General and Transferable Skills
What is a cultivar, Breeding methods in self pollinated crops	**1&2**	**a/1**	**-**	**-**	**d/1**
Selection procedures following hybridization, Back cross breeding	**3&4**	**a/2**	**-**	**-**	**d/2**
How breeding procedures for self pollinated crops the utilized & breeding cross pollinated and clonally propagated crops, Genetic structure of cross pollinated crops	**5&6**	**a/1**	**b/1**	**c/1**	**d/2,5**
Breeding seed propagated cross pollinated crops, Breeding clonally propagated are utilized & breeding hybrid cultivars	**7&8**	**a/2**	**b/1**	**c/1**	**d/3,4**
The origin of hybrid breeding, Inbreeding in cross pollinated crops	**9&10**	**a/1**	**b/1**	**c/2**	**d/1,3**
Hybrid vigor or Heterosis, Breeding single cross hybrid cultivars	**11&12**	**a/1**	**-**	**c/2**	**d/2,5**
Breeding objectives and techniques	**13&14**	**a/2**	**b/1**	**-**	**d/1,2**

Course coordinator : **Dr. Khaled F. M. Salem**
Head of the department council **Prof. Haroun Abou Shama**

Date:

Department: **Plant Biotechnology**

Course Specifications

66. Course information:							
Course Code:	**B3-40**	**Course Title:**	**Natural products from plants**				
No. units	**3**	**Lec.**	**3**	**App.**	**-**	**Level**	**MSc.**
Department	**Plant Biotechnology**						

67. Course Aims	
	1- Preparing highly qualified and market-ready graduates in plant natural products, competitive at the national and international level, in both academic and applied fields. 2-Applying and able to handling the changeable requirements of the field of plant natural products. 3- Enhancing students and researches capabilities and storming their knowledge, intellectual and practical skills in the area of natural products. 4- Demonstrating awareness of the ongoing problems in the surrounding natural product from plant.

68. Intended Learning Outcomes of Course (ILO's)	
rr.Knowledge and Understanding:	a/1 summarize the basics of scientific research and different research methodology (approaches) adopted to solve scientific problems. a/2 Express the general issues and application of plant biotechnology in the field of natural products. a/3 Classify main scientific advances of using General biology and Molecular genetics Biochemistry of nucleic acids. a/4- Describe the different methods of analysis for the plant natural products.

ss. Intellectual skills:	b/1 Deduce scientific output from the given research information. b/2 Comprehend the general issues, biosynthesis and application of plant natural products b/3 Link between the plant biotechnology and the application under Egyptian environment.
tt. Professional Skills:	c/1 understanding the different formula for growth media of specific biological plant organs and different groups of fungi and bacteria. c/2 Deal with the various methods for evaluation, and analysis of plant natural products.
uu. General and Transferable Skills	d/1 Acquire of self confidence and leadership skills. d/2 Work effectively in teamwork d/3 Use Application of Computer in the Field of Interest d/4 Appear self learning abilities in the field of interest,

	69. Course Contents:
No.	**Topic**
1	Introduction, Screening for natural products
2	Lipids and derivatives, Terpenes
3	Alkaloids, physical and Chemical properties
4	Aromatics and Phenols
5	carbohydrates
6	Nucleosides; Nucleotides and Nucleic acid.
7	Plant natural product production, Case studies

70. Teaching and Learning Methods	
	- Lectures - Scientific seminars and presentation - Students activity -Discusion / Reports

71. Teaching and Learning Methods (for	Not applicable

students with special needs)	

7. Student Assessment:		
a. Assessment Methods:	* Oral exam, * Written (Final) exam.	
b. Assessment Schedule	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam	5^{th} &10^{th} works 8^{th} week, 16^{th} week, 16^{th} week.
c. Weighting of Assessments	Oral exam Semester work Written exam Total	20 degrees 20 degrees 60 degrees 100 degrees
		Ratios 20%, Ratios 20%, Ratios 60%, Ratios 100%.

72. List of References:	
hh. Notes	Prepared by the co-ordinator
ii. Essential Books (Text Books)	1- Studies in Natural products chemistry. 2001, ELSEVIER Medicinal chemistry of bioactive 2- Natural products. 2006 by John Wiley & Sons, Inc.
jj. Suggested Books	1- Modern Phytomedicine. 2006, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim 2- 2. Cseke L.J., Kirakosyan A., Kaufman P.B., Warber S.L., Duke J.A. and Brielmann H.L. Natural Products from Plants, 2nd edition, Taylor & Francis group, 2006.
kk. Periodicals, Web Sites, … etc ...	1- Records of natural products 2- Natural products, Phytochemistry 3- Natural product reports

Course coordinator : **Dr. Emad Mahros and Khalid Mazroua**

Head of the department: **Prof. Haroun Abou Shama**

University of Sadat City
Genetic Engineering and
Biotechnology Research Institute.
Quality Assurance and Continuous
Improvement Unit

جامعة مدينة السادات
معهد بحوث الهندسة الوراثية والتكنولوجيا الحيوية
وحدة ضمان الجودة والتطوير المستمر

Matrix of Knowledge and skills of the educational course targeted

Course name: Natural products from plants (B3-40)
Department: Plant Biotechnology
MSc Course

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1	Introduction Screening for natural products	a/1,2	b/1	c/2	d/1,2
2	Lipids and derivatives Terpenes	a/1,4	b/2	c/2	d/4
3	Alkaloids, physical and Chemical properties	a/2	b/3	c/2	d/4
4	Aromatics and Phenols	a/2,4	b/2	c/2	d/4
5	carbohydrates	a/2,4	b/2	c/2	d/4
6	Nucleosides; Nucleotides and Nucleic acid.	a/3	b/2	-	d/2
7	Plant natural products production Case studies	a/1	b/1	c/1	d/1,2,3

Course coordinator : **Dr. Emad Mahros and Khalid Mazroua**

Head of the department: **Prof. Haroun Abou Shama**

Department: **Plant Biotechnology**

Course Specifications

73. Course information:							
Course Code:	**B3-42**	**Course Title:**	**Plant breeding for pest and disease resistance**				
No. units	**3**	**Lec.**	**3**	**App.**		**Level**	**MSc**
Department	**Plant Biotechnology**						

74. Course Aims	
	- Introducing genetics of resistance and pathogencity of pests and diseases - Providing principles of breeding for diseases and pests in plants. - Assessment of Insect-Pest resistance and management of disease and Insect Resistance.

75. Intended Learning Outcomes of Course (ILO's)	
vv. Knowledge and Understanding:	a/1) Express the losses due to pests and diseases, History of breeding for pest and disease resistance and The Value of Insect Resistance. a/2) Summarize Genetics of resistance and pathogencity, Insect and disease-Plant Interactions and the Mechanisms of Resistance . a/3) Divide Breeding and Stability of Resistance to Insects and diseases and Production of Insect-Resistant Plants by Unconventional Breeding a/4) Explain the manipulation of plant to be resistant to insect by the main of genetic transformation.
ww. Intellectual skills:	b/1) Investigate the genetics of resistance and pathogencity. b/2) Suggest programs for breeding to produce plants resistant to insects and diseases by different methods of plant transformation.

xx. Professional Skills:	c/1) Perform laboratory and field tests for plant resistance to diseases and insects.
yy. General and Transferable Skills	d/1) Collect the knowledge from data sources, *e.g.*, text books, scientific journals, internet, multimedia…etc. d/2) Acquire of self confidence and leadership skills, Self-learn and distance learn capabilities. d/3) Organize and manage scientific seminars and presentation, work effectively in teamwork.

76. Course Contents:

No.	Topic
1	Introduction, Losses due to pests and diseases, History of breeding for pest and disease resistance and The Value of Insect Resistance
2	Genetics of resistance and pathogencity
3	Insect- and disease Plant Interactions and the Mechanisms of Resistance
4	Sources of Resistance and Methods of Testing for Resistance
5	Breeding and Stability of Resistance to Insects and diseases
6	Production of Insect and disease-Resistant Plants by Unconventional Breeding
7	Transformation for production of insect and disease resistant plants

77. Teaching and Learning Methods	
	9. Data show 10. Scientific Journals 11. Text books 12. Internet

78. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

79. List of References:	
ll. Essential Books (Text Books)	1. Breeding plants resistant to insects Maxwell, F. E., Jennings, P. R. 2. Disease and Insect Resistance in Plants D.P. Singh and Arti Singh ISBN 978-1-57808-412-8; 2005 3. Host Plant Resistance to Insects *by* Gurdev S. Khush, Niranjan Panda
4. Periodicals, Web Sites, … etc ...	• J. Plant Breeding • Crop Sceince

Course Coordinator : **Dr. Yehia Khidr**
Head of the department: **Prof. Haroun Abou Shama**

Matrix of Knowledge and skills of the educational course targeted
Course name: Plant breeding for pest and disease resistance (B3-42)

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1	Introduction, Losses due to pests and diseases, History of breeding for pest and disease resistance and The Value of Insect Resistance	a/1	b/1,2	c/1	d/1
2	Genetics of resistance and pathogencity	a/2	b/1,2	c/2	d/2
3	Insect and disease-Plant Interactions and the Mechanisms of Resistance	a/2	b/1,2	c/1	d/3
4	Sources of Resistance and Methods of Testing for Resistance	a/2	b/1,2	-	d/1
5	Breeding and Stability of Resistance to Insects and diseases	a/3	b/1,2	c/1	d/2
6	Production of Insect and disease-Resistant Plants by Unconventional Breeding	a/3	b/1,2	c/1	d/3
7	Transformation for production of insect and disease resistant plants	a/4	b/1,2	c/1	d/3

Course Coordinator : **Dr. Yehia Khidr**
Head of the department: **Prof. Haroun Abou Shama**

Department: **Plant Biotechnology**

Course Specifications

80. Course information:							
Course Code:	B3-43	**Course Title:**	**Plant breeding for stress**				
No. units	3	**Lec.**	3	**App.**		**Level**	M.Sc
Department	**Plant Biotechnology**						

81. Course Aims	
	1. Providing students with fundamental structure and reproductive features of crops. Their adaptation and importance in global agriculture. 2. Practicing and inputs needed for economic production of a quality product and interaction of these factors within the constraints of climate, soils, and topography in maintaining a quality environment. 3. Applying breeding for abiotic tolerance. Experimental approaches for examining genetics of genotype-environment interactions, expression and stability of abiotic tolerance and breeding strategies for developing abiotic tolerance cultivars.

82. Intended Learning Outcomes of Course (ILO's)	
zz. Knowledge and Understanding:	a1) Recognize the basic rules of plant tissue culture, plant pathology, plant breeding, biotechnology of secondary products, breeding of disease-resistant plants, plant physiology, biotechnology of field, horticulture, vegetable and ornamental crops, and mushroom propagation. a2) Know the basic rules of plant breeding science,

	technology and molecular breeding and its biological impacts and genetic application. a3) Know the basics of breeding to insect resistance, stresses resistance and tolerance, especially the molecular breeding, genetic protection, gene technology and population biology
aaa. Intellectual skills:	b1) Discuss the different methods of plant breeding and its application. b2) Suggest programs for breeding to produce plants resistant or tolerant to different stresses, biotic or abiotic.
bbb. Professional Skills:	c1) Perform laboratory and field tests for molecular markers for plant breeding.
ccc. General and Transferable Skills	d1) Collect the knowledge from data sources, e.g., text books, scientific journals, internet, multimedia……etc. d2) Organize and manage scientific seminars and presentation.

	83. Course Contents:
No.	**Topic**
1	**Introduction, Importance of abiotic stress, Characteristics of abiotic stress**
2	**Breeding for drought resistance, Effects of drought resistance plant growth and development**
3	**Types of drought environment, Drought resistance**
4	**Genetic of drought resistance, Mineral stresses (salinity, mineral deficiency and mineral toxicity) and heat and cold resistance**
5	**Source of drought resistance, Relationship between drought resistance treat and yield.**
6	**Selection criteria, Breeding methods and approaches**
7	**Difficulties in breeding for drought resistance, Mineral stresses (salinity, mineral deficiency and mineral toxicity) and heat and cold resistance**

84. Teaching and Learning Methods	
	Theoretical lectures Practical works Lab experiments Scientific trips

85. Teaching and Learning Methods (for	Not applicable

students with special needs)	

7. Student Assessment:		
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.	
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.	
c. Weighting of Assessments	10degrees 10 degrees 20 degrees 60 degrees Total 100 degrees	Ratios 10%, Ratios 10%, Ratios 20%, Ratios 60%, Ratios 100%.

86. List of References:	
mm. Notes	Lectures written by course coordinator(s)
nn. Essential Books (Text Books)	Blum, A. (1988). Plant Breeding for Stress Environments. CRC Press Inc., Boca Raton, Florida, USA.
oo. Suggested Books	Singh, B. D., Plant Breeding
pp. Periodicals, Web Sites, … etc ...	Plant Breeding J., Crop Science J., plant pathology J.

Course coordinator : **Dr. Khaled F. M. Salem**
Head of the department : **Prof. Haroun Abou Shama**

Date:

Matrix of Knowledge and skills of the educational course targeted
Course Plant breeding for stress B3-43

Contents	Week No.	a- Knowledge and Understanding	b- Intellectual skills	c- Professional Skills	d- General and Transferable Skills
Introduction, Importance of abiotic stress, Characteristics of abiotic stress	1&2	a/1,2	b/1	-	d/1
Breeding for drought resistance, Effects of drought resistance plant growth and development	3&4	a/1,2	b/1	c/1	d/2
Types of drought environment, Drought resistance	5&6	a/3	b/2	-	d/1
Genetic of drought resistance, Mineral stresses (salinity, mineral deficiency and mineral toxicity) and heat and cold resistance	7&8	a/3	b/2	c/1	d/2
Source of drought resistance, Relationship between drought resistance treat and yield	9&10	a/3	b/2	c/1	-
Selection criteria, Breeding methods and approaches	11&12	a/2,3	b/1	c/1	-
Difficulties in breeding for drought resistance, Mineral stresses (salinity, mineral deficiency and mineral toxicity) and heat and cold resistance	13&14	a/2	b/2	c/1	d/1

Course coordinator : **Dr. Khaled F. M. Salem**
Head of the department council **Prof. Haroun Abou Shama**

Date:

Course Specifications

87. Course information:							
Course Code:	B3-45	**Course Title:**	Plant diseases				
No. units	3	**Lec.**	3	**App.**		**Level**	M.Sc
Department	**Plant biotechnology**						

88. Course Aims	
	2/1- knowing the general concept of diseases. 2/2- Understanding the relationship between diseases and diagnosis. 2/3- Determining research subjects, collecting & developing information and applying analytical and critical approach to knowledge about diseases control.

89. Intended Learning Outcomes of Course (ILO's)	
ddd. Knowledge and Understanding:	a/1- classify the disease. a/2- describe pathogen control methods. a/3- summarize plant parasitic relationship.
2- Intellectual skills:	b/1- Plan classification of disease. b/2- Compare between relationship between pathogen and plant. b/3- Interpret evidences weapons of attack
3- Professional Skills :	c/1- Apply advanced professional skills in laboratory tests c/2- Form methods to evaluate different management methods. c/3- Measure use enzyme in plant disease**.**
4- General and Transferable Skills	d/1- Work on team. d/2- Communicate with others. d/3- Use Application of Computer in the Field of Interest.

	4. Course Contents:

No.	Topic
1	Introduction
2	The attacking pathogen
3	Pathogensis or disease development
4	Plant parasitic relationship
5	Enzymes of plant disease
6	The defending host
7	Methods of plant diseases control

5. Teaching and Learning Methods	
	1- Lectures 2- discussion 3-Reports 4-Presentation

3- Teaching and Learning Methods (for students with special needs)	Not applicable

4- Student Assessment:	
d. Assessment Methods:	*Semester work, *Midterm exam, *oral exam, *written (final) Exam,
e. Assessment Schedule	*(5th&10th weeks), *(6th) week, *(13th) week, *(14th) week, *(15th) week.
f. Weighting of Assessments	5 degree ratio 5% 5 degree ratio 5% 10 degree ratio 10% 10 degree ratio 10% 10 degree ratio 10% 60 degree ratio 60% Total 100 degrees ratio 100%

5- List of References:	
Notes	-
Essential Books (Text Books)	1- Trigiano, R. N.; Windham, M. T.; Windham, S.W. Plant Pathology, 2004 2- Dickinson, M. Molecular plant pathology, 2005. 3-Gnanamanickam, S. S. Biological control of crop diseases, 2002.
Suggested Books	1- Punja, Z. K.; De Boer, S. H.; Sanfaçon, H. biotechnology and plant diseases management, 2008. 2- Perry, R. N.; Moens, M. Plant Nematology, 2008. 3- Robinson, D. G. Cell Biology of Plant Nematode Parasitism, 2009. 4- Gaugler, R. and Bilgrami, A. L. Nematode Behavior, 2004.
qq. Periodicals, Web Sites, … etc ...	-

Course coordinator: **Dr. Mostafa Sayed El-Ansary**
Head of the department: **Prof. Haroun Aboushama**

Matrix of knowledge and skills of the Educational Course targeted

Course Contents	Week No.	a-Knowledge and Understanding	b-Intellectual skills	c- Professional Skills of course	d-General and Transferable Skills
Introduction	**1&2**	3. a/1	3. b/1	-	3. d/1
The attacking pathogen	**3&4**	3. a/2	3. b/1	-	3. d/1
Pathogensis or disease development	**5&6**	3. a/3	3. b/1, b/2	-	3. d/1
Plant parasitic relationship	**7&8**	3. a/3	3. b/2, b/3	3. c/1	3. d/1
Enzymes of plant disease	**9&10**	-	3. b/2, b/3	3. c/1,c3	3. d/2
The defending host	**11&12**	-	3. b/3	3. c/2	3. d/2
Methods of plant diseases control	**13&14**	-	-	3. c/2	3. d/2,d/3

Course coordinator : Dr. Mostafa Sayed El-Ansary
Head of the department: Prof. Haroun Abou shama

Course Specifications

90. Course information:							
Course Code:	**B3-48**	**Course Title:**	**Plant gene technology**				
No. units	**3**	**Lec.**	**3**	**App.**		**Level**	**MSc**
Department	**Plant Biotechnology**						

91. Course Aims	
	2/1 introducing the fundamentals of plant gene technology**.** 2/2 acquainting students with the knowledge of various aspects of plant gene technology applications including Plant nuclear genes, plastid genes, plastid transformation application and Sequencing, isolation of plant genes

92. Intended Learning Outcomes of Course (ILO's)	
eee. Knowledge and Understanding:	a/1 Describe the basics of plant gene technology a/2 Summarize the basic Sequencing, isolation, hybridization and library of genes. Restriction endonucleases and production of recombinant DNA a/3 Express various aspects of Microarrays, DNA profiling & significance, protein profiling and its significances, bioinformatics a/4 Divide different gene transfer methods and classify different modification of introducing desirable traits to plants.
fff. Intellectual skills:	b/1 Plan, conduct and write a report on plant gene technology b/2. Analyze and solve problems of sequencing, hybridization and library of genes and genetic transformation b/3. Interpret antisense RNA expressions, molecular farming and virus resistant transgenesis b/4. Derive microarrays, DNA profiling & significance, protein profiling and its significances.
ggg. Professional Skills:	c/1 Apply, or adapt, practical instructions safely and accurately

	c/2 Execute a variety of experimental procedures in the laboratory. c/3 Form and devise experimental methods appropriate for tackling a particular problem c/4 interpret quantitatively the results of experiments undertaken by themselves or others Apply the genetic modified plants for improving the high yield and plant disease and insect resistances.
hhh. General and Transferable Skills	d/1) Collect the knowledge from data sources, e.g., text books, scientific journals, internet, multimedia…etc d/2) Acquire of self confidence and leadership skills, Self-learn and distance learn capabilities.

93. Course Contents:

No.	Topic
1	Sequencing, isolation, hybridization and library of genes. Restriction endonucleases and production of recombinant DNA
2	Vector Mediated, Direct Transfer and Physical and chemical gene transfer methods
3	Transformation of chloroplast genome
4	Expression and measures of transgene, Marker genes. Antisense RNA expressions, heat shock gene transgenesis, stress resistant transgenesis.
5	Herbicide resistant transgenesis: Modification of the target metabolite, degradation of the herbicide and herbicide resistance through gene amplification. Insect resistant transgenesis: Bt – toxin gene trangenesis, protease inhibitor transgenesis.
6	Virus resistant transgenesis. Molecular farming.
7	Microarrays, DNA profiling & significance, protein profiling and its significances, bioinformatics

94. Teaching and Learning Methods

	13. Data show 14. Scientific Journals 15. Text books

95. Teaching and Learning Methods (for	Not applicable

students with special needs)	

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

96. List of References:	
rr. Essential Books (Text Books)	3. Principles and Methods in Plant Molecular Biology, Biochemistry and Genetics/Prathibha Devi. Jodhpur, 2000, 253 p. 4. Methods in Plant Molecular Biology and Biotechnology. Bernard R. Glick and John E. Thompson (eds.). CRC Press, Boca Raton, FL. 1993. 360 pp. ISBN 0-8493-5164-2. **2.** Methods in Plant Molecular Biology: A Laboratory Course Manual 1995 • 446 pp. ISBN 0-87969-386-X
ss. Periodicals, Web Sites, … etc ...	• Crop Science • Plant Breeding

	• TAG • Genome

Course Coordinator :	**Dr. Yehia A. Khidr**
Head of the department council:	**Prof. Haroun Abou Shama**

Matrix of Knowledge and skills of the educational course targeted
Course name: Plant gene technology (B3-48)

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional and practical skills	General and transferable skills
1	Sequencing, isolation, hybridization and library of genes. Restriction endonucleases and production of recombinant DNA	a/1,2	b/1, 2	c/1,2,3,4	d/1,2
2	Vector Mediated, Direct Transfer and Physical chemical gene transfer methods	a/1,4	b/1, 2	c/1,2	d/1,2
3	Maps of plant genomes and Transformation of chloroplast genome	a/1,4	b/1, 2	c/3,4	d/1,2
4	Expression and measures of transgenes, Marker genes. Antisense RNA expression, heat shock gene transgenesis, stress resistant transgenesis.	a/1,4	b/1, 3	c/2,3	d/1,2
5	Herbicide resistant transgenesis: Modification of the target metabolite, degradation of the herbicide and herbicide resistance through gene amplification. Insect resistant transgenesis: Bt – toxin gene trangenesis, protease inhibitor transgenesis.	a/1,4	b/1, 2	c/1,3	d/1,2
6	Virus resistant transgenesis. Molecular farming.	a/1,4	b/1, 2	c/1,4	d/1,2
7	Microarrays, DNA profiling & significance, protein profiling and its significances, Bioinformatics	a/1,3	b/1,4	c/2,4	d/1,2

Course Coordinator :	**Dr. Yehia A. Khidr**
Head of the department council:	**Prof. Haroun Abou Shama**

Department: **Plant Biotechnology**

Course Specifications

97. Course information:							
Course Code:	**B3-51**	**Course Title:**	**Plant Molecular Biology Methods**				
No. units	**3**	**Lec.**	**3**	**App.**		**Level**	**MSc**
Department	**Plant Biotechnology**						

98. Course Aims	
	1. Studying cell and gene function in plants are growing rapidly in power and sophistication. 2. A course for investigators who are familiar with molecular biology and want to use plants as experimental organisms. 3. Engaging in work with plant genes and in solving the many technical problems associated with advanced techniques in plant molecular biology. 4. Preparing well-qualified students and researches in both academic and applied levels in order to have the ability to meet the changeable requirements of the field of plant biotechnology

99. Intended Learning Outcomes of Course (ILO's)	
iii. Knowledge and Understanding:	a/1) Summarize the different plant molecular biology methods. a/2) Describe the isolation, cloning and sequencing of DNA and RNA. a/3) Classify the different methods of plant transformation. a/4) Divide the type of plant tissue culture and molecular marker in crop improvement.
jjj. Intellectual skills:	b/1) Derive the biological effects of using plant free pathogens, the different methods of micro-propagation in plants, the different methods of molecular markers and plant transformation and their application.

	b/2) Plan programs for isolation, cloning and sequencing of DNA and RNA and compare among DNA and RNA in these methods .
kkk. Professional Skills :	c/1) Perform laboratory and field tests for plant biotechnology. c/2) Apply the various methods for plant biotechnology.
lll. General and Transferable Skills	d/1) Collect the knowledge from data sources, e.g., text books, scientific journals, internet, multimedia…etc d/2) Acquire of self confidence and leadership skills, Self-learn and distance learn capabilities.

100. Course Contents:

No.	Topics
1	Plant Cell and Tissue Culture
2	DNA and RNA Isolation from different cell types
3	Cloning of DNA; cDNA and Genomic Library
4	DNA and RNA Sequencing and Dot plots
5	Molecular Markers in Plants and their applications
6	In Situ Hybridization
7	Plant Transformation and its applications

101. Teaching and Learning Methods

	16. Data show 17. Scientific Journals 18. Text books 19. Internet

102. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:

a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

103. List of References:

tt. Essential Books (Text Books)	5. Principles and Methods in Plant Molecular Biology, Biochemistry and Genetics/Prathibha Devi. Jodhpur, 2000, 253 p. 6. Methods in Plant Molecular Biology and Biotechnology. Bernard R. Glick and John E. Thompson (eds.). CRC Press, Boca Raton, FL. 1993. 360 pp. ISBN 0-8493-5164-2. 7. Methods in Plant Molecular Biology: A Laboratory Course Manual 1995 • 446 pp. ISBN 0-87969-386-X
uu. Periodicals, Web Sites, … etc ...	• Crop Science • Plant Breeding

	• TAG • Genome

Course coordinator : **Dr. Kamal F. Abdellatif**
Head of the department council: **Prof. Haroun Abou Shama**

University of Sadat City
Genetic Engineering and
Biotechnology Research Institute.
Quality Assurance and Continuous
Improvement Unit

جامعة مدينة السادات
معهد بحوث الهندسة الوراثية والتكنولوجيا الحيوية
وحدة ضمان الجودة والتطوير المستمر

Matrix of Knowledge and skills of the educational course targeted
Course name: Plant Molecular Biology Methods (B3-51)
Department: Plant Biotechnology
MSc Course

No.	Course topic	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1	**Plant Cell and Tissue Culture**	a/1,4	b/1	c/1	d/1
2	**DNA and RNA Isolation from different cell types**	a/1,2	b/2	c/2	d/2
3	**Cloning of DNA; cDNA and Genomic Library**	a/1,2	b/2	c/1	d/1
4	**DNA and RNA Sequencing and Dot plots**	a/1,2	b/2	c/2	d/2
5	**Molecular Markers in Plants and their applications**	a/1,4	b/1	c/1	d/1
6	**In Situ Hybridization**	a/1	b/2	c/2	d/2
7	**Plant Transformation and its applications**	a/1,3	b/1	c/1	d/2

Course coordinator : **Dr. Kamal F. Abdellatif**
Head of the department council: **Prof. Haroun Abou Shama**

Department: **Plant Biotechnology**

Course Specifications

1. Course information:							
Course Code:	**Code: B3-55**	**Course Title:**	**Somaclonal variation**				
No. units	3	**Lec.**	3	**App.**	----	**Level**	Msc
Department	Plant Biotechnology						

2. Course Aims	
	2-1 Improving knowledge of master graduate in identifying somaclonal variation causes, avoiding methods and how to achieve highest benefits of this problem. 2-2-Transferring the most updated technologies in the area of somaclonal variation detection methods 2-2 Enhancing the knowledge of application of somaclonal variation in plant breeding programs

3. Intended Learning Outcomes of Course (ILO's)	
a. Knowledge and Understanding:	a1-. Express the attitudes and ethical basis in scientific research and in plant biotechnology and summarize main basics & ethics of scientific researches. a2 Illustrate somaclonal variation, mutation and application of somaclonal variation a3.Summarize mechanisms of occurrence and methods of avoid somaclonal variation a4 know various methods of detection somaclonal variation
b. Intellectual skills:	b1- Compare among different aspects of plant improvement through plant molecular biology and cytogenetics, plant breeding and somaclonal variation b2.Discuss the plant tissue culture techniques causes of somaclonal variation. b3.-Suggest favorable method and technique for detect somaclonal

	variation. b4 -Evaluate the various methods for induction somaclonal variation.
c. Professional Skills:	c1 -Evaluate importance of Genetic bases variation in plant breeding programs c2 -Comparison advantage and disadvantage of somaclonal variation. c3 Perform methods for induction and detection somaclonal variation. c4 Deal with application of somaclonal variation in producing salt resistance plants.
d. General and Transferable Skills	d1 Practice self appraisal and determines his/her learning needs. d2 Acquire of self confidence and leadership skills d3 Organize and manage scientific seminars and presentation d4 Treat by Efficiency in self-learn and distance learn capabilities

	e. Course Contents: Somaclonal variation (B3-55)
No.	**Topic**
1	Somaclonal variation origin, induction and implications in plant tissue culture breeding
2	Mutation and cell cycle
3	Chromosome variation in plant tissue culture
4	Genetic bases of variation from in vitro
5	Optical techniques to measure genetic instability in cell and tissue culture
6	Somaclonal variation in plant breeding
7	Somaclonal variation for produce salt resistance plants

f. Teaching and Learning Methods	
	- Lectures - scientific seminars and presentation - Libraries and internet research (self learning)

g. Teaching and Learning Methods (for students with special needs)	**Not applicable**

h. Student Assessment:	
g. Assessment Methods:	- Activities (seminar and term paper -Mid. Term exam -Oral Exam -Written Exam -
h. Assessment Schedule	Semester Works (5^{th}&10^{th}),

	Midterm Exam (6th) Week, oral Exam (14th) Week, Written (Final) Exam (15th) Week.
i. Weighting of Assessments	**10/100…** **10/100** **20/100.** **60/100**

i. List of References:	
vv. Notes	**lectures**
ww. Essential Books (Text Books)	-Trigiano, R.N.and Gray, D.G.(2000): Plant tissue culture concepts and laboratory exercises. CRC Press, London. -Kumar U. (2001): Methods in plant tissue culture. -Eexperiments in tissue culture. -Plant cell and tissue culture.
xx. Suggested Books	-Wetherell, D.F.(1976): Introduction to in vitro propagation-Pajaj group
yy. Periodicals, Web Sites, … etc ...	- Periodicals, Web sites, etc - Plant cell tissue and organ culture journal

Course coordinator : Dr Ebtsam moubark Hamza
Head of Department: Prof. Haroun Abou Shama

Matrix of Knowledge, Skills ILOs for Somaclonal variation B3-55 Course

Course Contents	Week No.	a Knowledge and Understanding	b Intellectual skills	c Practical and Professional Skills of course	d General and Transferable Skills
Somaclonal variation origin, induction and implications in plant tissue culture breeding	1&2	a/1,2	b/1	c/1	d/1
Mutation and cell cycle	3&4	a/1	b/1	c/1	d/2
Chromosome variation in plant tissue culture	5&6	a/2,3	b/2, 3	c/2	d/2
Genetic bases of variation from in vitro	7&8	a/2,3	b/2, 3	c/2	d/3
Optical techniques to measure genetic instability in cell and tissue culture	9&10	a/3,4	b/3	c/3	d/4
Somaclonal variation in plant breeding	11&12	a/3,4	b/4	c/4	d/4
Somaclonal variation for produce salt resistance plants	13&14	a/3,4	b/4	c/4	d/4

Course coordinator : **Dr. Ebtsam moubark Hamza**
Head of Department: **Prof. Haroun Abou Shama**

Department: **Plant biotechnology**

Course Specifications

4. Course information:							
Course Code:	B3-56	**Course Title:**	**Somatic embryogenesis and synthetic seeds**				
No. units	3	**Lec.**	3	**App.**		**Level**	MSc
Department	**Plant biotechnology**						

5. Course Aims	
	1- Determining develop students knowledge in the field of asexual embryogeneisis ,induction, proliferation, histodifferentiation and haploid embryogeneisis all data bases related to *in vitro* . 2- Applying develop of the concept of artificial seeds, discovery and production of artificial seeds 3- providing training in encapsulation or coating of synthetic seeds. 4- developing of basic germplasm conservation

6. Intended Learning Outcomes of Course (ILO's)	
mmm. Knowledge and Understanding:	a/1 Describe the main concept of somatic embryogenesis and synthetic seeds and its application in Egypt. a/2 Summarize identify and describe the fundamentals of plant cell, tissue and organ culture and its applications for plant propagation. a/3 Classify the fundamentals of seed aging and storage. a/4 Summarize Basic facts, theories of the plant biotechnology and related subjects.
nnn. Intellectual skills:	b/1- Compare link between the plant biotechnology and the application .under Egyptian environment. b/2 Analyze and discuss the various types of plant cell cultures. b/3 Compare Classify the different methods of micropropagation of plants. b/4 Derive solving some problems that don't conform to

	classic data of plant biotechnology.
ooo. Professional Skills:	c/1 Apply the various methods for application of tissue cultures. c/2 Apply practice the field evaluation of the transformations and regenerants and different species of the plants. c/3 Execute programs and methods for plant breeding and improvement through different ways. c/4 Measure and evaluation methods and tools used in plant biotechnology fields.
ppp. General and Transferable Skills	d/1 Work effectively in a team. d/2 Acquire of self confidence and leadership skills . d/3 Participate in workshops and training courses d/4 Use information technology to improve his/her professional practice.

	7. Course Contents:
No.	**Topic**
1	Glossary and some historical notes of *in vitro* embryoygenesis
2	Theoretical aspects of plant cell, Biochemical changes during embryo development
3	Asexual embryogenesis in vascular plants in nature and haploid embryogenesis
4	Development of the concepts of tissue culture and artificial seeds
5	Procedure of synthetic seeds production and various type of hydrogels
6	Micropropagation stages , Application of synthetic seeds
7	Cryopreservation in plant biotechnology, Application of germplasm conservation

8. Teaching and Learning Methods	
	Lectures Class activities Discussion Presentation Reports

9. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10 degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

8. List of References:	
zz. Notes	
aaa.Essential Books (Text Books)	-**Kumar U. (2001)**: Methods in plant tissue culture. **Narayanaswamy,S(2002):** Plant cell and tissue culture -**Wetherell, D.F.(1976):** Introduction to *in vitro* propagation - **Purohit, S. S. (1998).** Somatic embryogenesis principles, concepts and applications. Agricultural biotechnology. Agro Bot., 81: 239-259. -**West, M. A. L. and Harada, J. J. (1993).** Embryogenesis in Higher plants: An overview. Plant Cell 5, 1361-1369
bbb. Suggested Books	**Gamborg, O.L. and Phillips G.C. (1995):** Plant cell, tissue and organ culture.
ccc. Periodicals, Web Sites, … etc ...	BGCI(2005)In: http://www.bgci.org/

Course coordinator :Dr. Ahmed Nower, Dr.Awatef Badrelden

Head of the department council: Prof. Haroun Abou Shama

Matrix of Knowledge, Skills ILOs for Education Course

Course Contents	Week No.	a-Knowledge and Understanding	b- Intellectual skills	c- Professional Skills of course	d-General and Transferable Skills
Glossary and some historical notes of in vitro embryogenesis	**1&2**	**a1**	**b2**	**c1,c3**	**d4**
Theoretical aspects of plant cell, Biochemical changes during embryo development	**3&4**	**a1,a2**	**b2,b3**	**c1,c3**	**d2,d3,d4**
Asexual embryogenesis in vascular plants in nature and haploid embryogenesis	**5&6**	**a2**	**b/1, b3**	**c1,c3**	**d2,d3**
Development of the concepts of tissue culture and artificial seeds	**7&8**	**a1,a4**	**b3,b4**	**c1,c4**	**d2,d3**
Procedure of synthetic seeds production and various type of hydrogels	**9&10**	**a1,a2,a4**	**b2,b3**	**c1,c4**	**d2,d3**
Micropropagation stages , Application of synthetic seeds	**11&12**	**a2,a4**	**b2,b3**	**c1,c4**	**d2,d3,d4**
Cryopreservation in plant biotechnology, Application of germplasm conservation	**13&14**	**a2,a3,a4**	**b2,b3,b4**	**c1,c4**	**d2,d3,d4**

Course Coordinators: Dr. Ahmed Nower, Dr.Awatef Badrelden
Head of Department: Haroun Abou Shama

Department: Plant Biotechnology

Course Specifications

Course information:							
Course Code:	**B3-59**	**Course Title:**	Tissue and cell culture practices in plants				
No. units	3	**Lec.**	3	**App.**		**Level**	MSc
Department	Plant Biotechnology						

Course Aims	
	• Transferring the most updated skills and technologies in the area of plant biotechnology to the scientific staff via accomplishment of workshops, meetings and conferences. - Enhancing students and researches capabilities and storming their intellectual and practical skills. - Providing training in scientific skills of problem analysis, research design, evaluation empirical evidence and dissemination in the context of biological sciences.

Intended Learning Outcomes of Course (ILO's)	
a-Knowledge and Understanding:	a1 Express the attitudes and ethical basis in scientific research and in plant biotechnology and summarize main basics & ethics of scientific researches. a2 Define the tissue culture methods and illustrate tissue culture application. a3 Explain methods production protoplast, virus free plants, haploid plants and somatic hybridization. a4 Train in use somaclonal variation in plant breeding through tissue culture technique.
b-Intellectual skills:	b1Derive issues which the Scientifics facing during plant improvement and biotechnology and take a professional decision for suitable methods to improve the productivity and quality of plants. b2 Discuss uses of somaclonal variation in plant breeding.

	b3 Design a protocol for producing one of the application of tissue culture. b4 Evaluate the methods of somatic hybridization.
c-Professional Skills of course:	c1 Prepare technical reports and scientific essay. c2 Solving problem related with plant using tissue culture techniques. c3 Train in cryopreservation *in vitro,* production of haploid plants. c4 Apply the various methods for application plant tissue cultures.
d-General and Transferable Skills	d1 Take professional decision for suitable methods in plant biotechnology subjects d2 Collect the knowledge from data sources, e.g., text books, scientific journals, internet, multimedia……etc. d3 Acquire of self confidence and leadership skills d4 Organize and manage scientific seminars and presentation and self-learn and distance learn capabilities

	Course Contents:
No.	**Topic**
1	Micropropagation as application of tissue culture
2	Micrografting as a method of solving problems
3	Production of virus –free plants as biotechnological application
4	Plant conservation as biotechnological application
5	Plant breeding via : a) somaclonal variation
6	b) Haploid Experiments in production of secondary metabolites.
7	Application of production secondary metabolites in vitro

Teaching and Learning Methods	
	- Lectures - scientific seminars and presentation -Laboratory facilities - self learning

Teaching and Learning Methods (for	**Not applicable**

students with special needs)	

Student Assessment:	
Assessment Methods:	-Oral Exam…… …. to assess General and Transferable skills, Intellectual skills, understanding & knowledge -Written Exam to assess Intellectual skills, understanding & knowledge. -Practical Exam to assess the Practical skills - Evaluate his work in planning and analysis his experiment
Assessment Schedule	Semester Works (5th&10th), Midterm Exam (6th) Week, Practical Exam and oral Exam (14th) Week, Written (Final) Exam (15th) Week.
Weighting of Assessments	**5/100=…%,5/100=…%,10/100=.%,10/100=.%, 10/100=.%, 60/100=…%**

List of References:	
Notes	**مذكرة غير منشورة**
Essential Books (Text Books)	- Eexperiments in tissue culture. • **-An introduction to plant tissue culture (1993)byM.K.Razdan, Oxford, Newdelhi --Plant** A handbook of plant tissue culture by White, Philip R. (Philip Rodney), 1901-
Suggested Books	Pajaj group
...Periodicals, Web Sites, … etc	- Plant cell tissue and organ culture journal

Course coordinator: **Dr. Ebtsam Moubark**
Head of the department: **Prof. Dr. HarounAbou Shama**
Date:

Matrix of Knowledge, Skills ILOs for Education Course B3-59 Tissue and cell culture practices in plants

Course Contents	Week No.	Knowledge and Understanding	Intellectual skills	Practical and Professional Skills of course	General and Transferable Skills
Micropropagation as application of tissue culture	1&2	a2,3	b1	C3	d2
Micrografting as a method of solving problems	3&4	a1,3	b3,4	C2	d1
Production of virus –free plants as biotechnological application	5&6	a3	b3,4	C2	d4
Plant conservation as biotechnological application	7&8	a2,3	b3,4	C2	d3
Plant breeding via : a) somaclonal variation	9&10	a2,3	b2,3	C1	d1
b) haploid Experiments in production of secondary metabolites.	11&12	a2,3	b2,3	C4	d2
Application of production secondary metabolites in vitro	13&14	a4	b4	C4	d3

Course coordinator: **Dr Ebtsam moubark**
Head of the department: **Prof. Dr. HarounAbou Shama**
Date:

Department: **Plant biotechnology**

Course Specifications

10. Course information:							
Course Code:	B3-61	**Course Title:**	**Transgenic plants**				
No. units	3	**Lec.**	3	**App.**		**Level**	M.Sc
Department	**Plant biotechnology**						

11. Course Aims	
	1) Introducing students to the basic biological concepts, methodologies and issues associated with transgenic crop plants. 2) Improving by introducing foreign genes. 3) Confirming transgenic crops at molecular level. 4) Impact of transgenic crops on the environment.

12. Intended Learning Outcomes of Course (ILO's)	
qqq. Knowledge and Understanding:	a/1 Express and Outline the fundamentals and application of plant protoplast and genetic transformation. a/2 Describe the selectable marker genes and their use in transgenic plants. a/3 Summarize the different molecular confirmation methods of transgenic plants.
rrr. Intellectual skills:	b/1 Analyze the different methods of plant transformation and its application. b/2 drive and plan to produce transgenic plants resistant or tolerant to different stresses, biotic or abiotic. b/3 Compare among different methods of plant transformation and field performance of the transgenic plants and their application in plant biotechnology.
sss. Professional Skills:	c/1 Interpret the applying of genetic modified plants for improving the high yield and plant disease and insect resistances. c/2 Measure the transformation and regeneration efficiency

	depending on type of tissue and transformation methods.
ttt. General and Transferable Skills	d/1 Work effectively in a team. d/2 Acquire of self confidence and leadership skills . d/3 Participate in workshops and training courses. d/4 Take a professional decision for suitable methods of genetic transformation.

	13. Course Contents:
No.	**Topics**
1	Introduction to plant transformation
2	Methods of plant transformation
3	Protoplasts isolation and transformation
4	Applications of plant transformation
5	Selectable marker genes
6	Molecular checking of transgenic plants.
7	Field testing and commercialization of transgenic plants.

14. Teaching and Learning Methods	
	Lectures Class activities Discussion Presentation Reports

15. Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Oral exam, * Written (Final) exam.

b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.	
c. Weighting of Assessments	10degrees	Ratios 10%,
	10 degrees	Ratios 10%,
	20 degrees	Ratios 20%,
	60 degrees	Ratios 60%,
	Total 100 degrees	Ratios 100%.

16. List of References:	
ddd. Notes	Hand out to the students in addition to internet-based courses
eee. Essential Books (Text Books)	
fff. Suggested Books	**-Jones, H.1995.** Plant gene transfer and expression protocol. Human Press Inc. Totowa, New Jersey.
ggg.Periodicals, Web Sites, … etc ...	**-Rosser, S. F. ; French C. E. and N. Bruce. 2001.** Engineering plants for the phytodetoxification of explosive. In Vitro Cell. Dev. Biol. Plant. 37:330-333. **-Rugh, C. 2001.** Mercury detoxification with transgenic plants and other breakthroughs for phytoremedation. In Vitro Cell. Dev. Biol. Plant. 37:321-325. **-Sharma K. and R. Ortiz. 2000.** Program for the application of genetic transformation for crop improvement in the semi-arid tropics. In Vitro Cell. Dev. Biol. Plant. 36:83-92. **-Songstad, D. Somers D. A. and R. J. Griesbach. 1995.** Advances in alternative DNA delivery techniques. Plant Cell Tiss.Org.Cult.40:1-15.

Course coordinator :	**Dr. Dr.Awatef Badrelden**

Head of the department council:	**Prof. Haroun Abou Shama**
Date:	

Matrix of Knowledge, Skills ILOs for Education Course Transgenic plants
Transgenic plants (B3-61)

Course Contents	Week No.	a-Knowledge and Understanding	b- Intellectual skills	c- Professional Skills	d-General and Transferable Skills
Introduction to plant transformation	**1&2**	a1	b1,2,3	c1,c2	d3,d4
Methods of transformation	**3&4**	a1	b1,2,3	c1,c2	D2,d4
Protoplasts isolation and transformation	**5&6**	a1	b1,2,3	c1,c2	D1,d4
Applications of transformation	**7&8**	a1	b1,2,3	c1,c2	d3,d4
Selectable marker genes	**9&10**	a2	b1,2,3	c1,c2	d1, d4
Molecular checking of transgenic plants.	**11&12**	a3	b1,2,3	c1,c2	d3,d4
Field testing and commercialization of transgenic plants.	**13&14**	a3	b1,2,3	c1,c2	d1, d4

Course coordinator :	**Dr. Dr.Awatef Badrelden**
Head of the department council:	**Prof. Haroun Abou Shama**
Date:	

Department: Plant biotechnology

Course Specifications

17. Course information:							
Course Code:	**B3-65**	**Course Title:**	**Special Topics**				
No. units	3	**Lec.**	3	**App.**	-	**Level**	MSc
Department	Plant biotechnology						

18. Course Aims	
	This special course will provide the fundamental knowledge and skills that are required to each candidate according to his/her Master's thesis. The topics selected by the advisor will cover and enhance different fields and multidiscipline areas of the candidate's thesis in order to fulfil a complete comprehension and mastering of the research point.

19. Intended Learning Outcomes of Course (ILO's)	
uuu. Knowledge and Understanding:	a1- Selected according to the candidate's thesis
vvv. Intellectual skills:	b1-Selected according to the candidate's thesis
www. Professional Skills of course:	c1-Selected according to the candidate's thesis
xxx. General and Transferable Skills	d/1- Communicate effectively using all methods. d/2- Practice self appraisal and determine his/her learning needs. d/3- Use different scientific data resources (text books, journals, periodicals and internet web sites) to gain scientific knowledge

	and data. d/4- Determine standards for evaluation of others d/5- Practice independent learning and seek continuous learning.

	20. Course Contents:
Week No.	**Topic**
1	The topics of this course will be selected according to each candidate to enhance the multi disciplines in his/her Master's thesis.
2	
3	
4	
5	
6	Student presentations
7	Revision, Problems and answers

21. Teaching and Learning Methods	
	1- Presentations 2- Projector slides 3- Data show 4- Lectures

22. Teaching and Learning Methods (for students with special needs)	**Not applicable**

23. Student Assessment:	
j. Assessment Methods:	*Semester works, *Midterm exam, *Oral exam**,** *Written (Final) exam**.**
k. Assessment Schedule	* (5^{th}&10^{th} weeks)**,** * (6^{th}) Week**,**

	* (14^{th}) Week, * (15^{th}) Week.
l. Weighting of Assessments	10 degrees ratios 10%, 10 degrees ratios 10%, 20 degrees ratios 20 %, 60 degrees ratios 60% Total 100 degrees ratios 100%

24. List of References:	
hhh. Essential Books (Text Books)	According to the course topics
iii. Periodicals, Web Sites, … etc ...	According to the course topics

Course coordinator : Dr. yehia khidr &Thesis Advisor

Head of department council: **Prof. Haroun Abou Shama**
Date:

Matrix of Knowledge and skills of Special Topics course (B3-65)

No.	Course topic	Week No.	Knowledge and understanding	Intellectual abilities	Professional skills	General and transferable skills
1		**1&2**				
2		**3&4**				
3		**5&6**				
4		**7&8**				
5		**9&10**				
6	Student presentations	**11&12**				
7	Revision, Problems and answers	**13&14**				

Course coordinator : Dr. yehia khidr, Thesis Advisor

Head of department council: **Prof. Haroun Abou Shama**

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Department: **Plant Biotechnology**

Course Specifications

25. Course information:							
Course Code:	**B3-66**	**Course Title:**	**Seminars**				
No. units	3	**Lec.**	3	**App.**		**Level**	Master's
Department	**Plant Biotechnology**						

26. Course Aims	
	2- Providing the fundamental knowledge of seminars required to analyze and present scientific research. 3- Studying how to prepare handouts and visual aids; structuring the Oral Presentation in his thesis. 4- Dealing with the proper own conclusions about the tutorial readings, and additional relevant information 4- Providing the main divisions of the fundamental concepts of presentation topic, Observation; repetition, and pre-evaluation

27. Intended Learning Outcomes of Course (ILO's)	
a-Knowledge and Understanding:	a/1- Express the basic rules of basic seminar skills as understanding, Talking, presentation and conversation. a/2- Describe the basic rules of talking, demonstrating and understanding of the main points of tutorial readings. a/3- Divide the fundamentals of structuring the Oral Presentation. a/4- Summarize the differences between various types of handouts and visual aids; structuring the Oral Presentation. a/5- Classify various methods of preparation seminars.
b-Intellectual skills:	b/1- Compare different methods for reading background materials. b/2- Analyze problems of the various kinds of preparing and delivering presentations. b/3- Interpret the main points of tutorial readings, and additional relevant information. b/4- Plan seminars in the field of molecular diagnostics and therapeutics.
c- Professional Skills of course:	c/1- Form remarks about observation; repetition, and pre-evaluation of other students in the English course. c/2- Measure different seminar skills

	c/3- Apply various methods for reading background seminar materials. c/4- Execute some different handouts and visual aids related to seminars.
d-General and Transferable Skills	d/1- Communicate effectively using all methods. d/2- Use information technology to improve his/her professional practice. d/3- Practice self appraisal and determine his/her learning needs. d/4- Use different scientific data resources (text books, journals, periodicals and internet web sites) to gain scientific knowledge and data. d/5- Determine standards for evaluation of others. d/6- Work in teams and lead work teams in different professional contexts. d/7- Manage effectively time. Practice independent learning and seek continuous learning.

	28. Course Contents:
Week No.	**Topic**
1&2	Reading background material; how to analyze the audience; What are their needs, constraints, knowledge level? a assignment criteria
3&4	Preparing and delivering a talk , demonstrate an understanding of the main points of tutorial readings, and additional relevant information
5&6	Expressing the proper own conclusions about the opinion/argument/ thesis that the author is trying to express. How to demonstrate an ability to evaluate the strengths and weaknesses in the material presented in the texts.
7&8	Preparing handouts and visual aids; Structuring the Oral Presentation in his thesis
9&10	Preparing relevant and thought-provoking questions and leading a group discussion
11&12	Submitting a written assignment based on the presentation topic, estimating timing and tutorial discussion, and how to answer questions.
13&14	Observation; repetition, and pre-evaluation.

Teaching and Learning Methods	
	1- Presentations 2- Projector slides 3- Data show 4- Lectures

29. Teaching and Learning Methods (for students with special needs)	**Not applicable**

30. Student Assessment:	
m. Assessment Methods:	*Semester works, *Midterm exam, *Oral exam, *Written (Final) exam.
n. Assessment Schedule	* (5^{th}&10^{th} weeks), * (6^{th}) Week, * (14^{th}) Week, * (15^{th}) Week.
o. Weighting of Assessments	10 degrees ratios 10%, 10 degrees ratios 10%, 20 degrees ratios 20 %, 60 degrees ratios 60% Total 100 degrees ratios 100%

31. List of References:	
jjj. Essential Books (Text Books)	1- Robert L. Jolles (2005) How to Run Seminars & Workshops: Presentation Skills for Consultants, Trainers and Teachers. PP 320. 2- Terry Adams (2006) Start Your Own Seminar Production Business: your Step-by-step guide to Success. 3- Jennifer Rotondo and Mike Rotondo (2011) Presentation skills for managers. McGraw-Hill.
kkk. Periodicals, Web Sites, … etc …	http://www.books.google.com.eg http://www.Josseybass.com

Course coordinator : **Dr. Yehia Khidr**

Head of department council: **Prof. Haroun Abou Shama**
Date:

Matrix of Knowledge and skills of Seminar course (B3-66)

No.	Course topic	Week No.	Knowledge and understanding	Intellectual abilities	Prof. skills	General and transferable skills
1	Reading background material; how to analyze the audience; What are their needs, constraints, knowledge level? a assignment criteria	**1&2**	**a/1, a/2**	**b/1**	**c/1**	**d/1, d/3,**
2	Preparing and delivering a talk , demonstrate an understanding of the main points of tutorial readings, and additional relevant information	**3&4**	**a/3**	**b/2**	**c/2**	**d/2**
3	Expressing the proper own conclusions about the opinion/argument/ thesis that the author is trying to express. How to demonstrate an ability to evaluate the strengths and weaknesses in the material presented in the texts.	**5&6**	**a/4, a/5**	**b/3**	**c/3, c/4**	**d/2, d/3**
4	Preparing handouts and visual aids; Structuring the Oral Presentation in his thesis	**7&8**	**a/3**	**b/1, b/4**	**c/3**	**d/1, d/4**
5	Preparing relevant and thought-provoking questions and leading a group discussion	**9&10**	**a/4**	**b/3**	**c/1**	**d/2, d/5**
6	Submitting a written assignment based on the presentation topic, estimating timing and tutorial discussion, and how to answer questions.	**11&12**	**a/5**	**b/4**	**c/2**	**d/1, d/6**
7	Observation; repetition, and pre-evaluation.	**13&14**	**a/2**	**b/2**	**c/3, c/4**	**d/1, d/7**

Course coordinator : **Dr. Yehia Khidr**

Head of department council: **Prof. Haroun Abou Shama**

Date:

Department: Plant Biotechnology

Course Specifications

Course information:							
1. Course Code:	C-34	Course Title:	Experiments in plant tissue culture III				
No. units	3	Lec.	2	App.	2	Level	Msc
Department	Plant Biotechnology						

2. Course Aims	
	2-1-Improving skills of the Master graduate in plant tissue culture, identifying problems and using available resources to solve them & to achieve the highest benefits. 2-2-Enhancing practical skills of graduated students in tissue culture techniques 2-3-Improvement thinking and analytical ability of students.

3. Intended Learning Outcomes of Course (ILO's)	
a. Knowledge and Understanding:	a1-Describe the principles of plant tissue culture techniques, methods of plant diseases control, and the main concept of somatic embryogenesis, micropropagation, micrografting and microtuber. a2-Aware with the different methods of miropropagation, production plant disease-free and the main scientific applications of using biotechnology, plant tissue culture and genetic engineering on the field of plant biotechnology. a3-Training in designing of simple tissue culture experiments and analysis data using computer program
b. Intellectual skills:	b1-Interpret different information to solve the problems of different stress facing plant biotechnology and propagation. b2-Analyzing and evaluating information (measuring – devising – decision making) in plant tissue culture

	b3-Innovate simple methods for present his or her recorded results b4-Evaluate different methods of virus free production, micro-grafting, somatic embryogenesis production and production secondary metabolites
c.Practical and Professional Skills of course:	c1-Apply the different methods for plant propagation methods, producing of virus –free plants, micro grafting methods, producing secondary metabolites and somatic embryos. c2-prepare a protocol for solving problem related with tissue culture techniques c3-Estimate methods of data analysis
d.General and Transferable Skills	d1-Work in teams and manage time effectively. d2-Show management skills for using information d3-Technology to improve his professional practice in internet and relative information. d4-Treat by Efficiency in self-learn and distance learn capabilities.

4	**Course Contents:**
No.	**Topic**
1	Experiments in solving physiological disorders.(training session: design and follow up experiment in factors affecting physiological disorders)
2	Experiments in production of free virus plants.
3	Experiments in micro-grafting (training session: training in mcrografting)
4	Experimen.ts in production bulbs *in vitro* and cryopreservation (training session: design a trail to produce microtubers)
5	Experiments in producing somatic embryos. (training session: follow up experiments)
6	Experiments in production of secondary metabolites.(training session: design a protocol for producing secondary metabolites)
7	Training in using analysis program for data analysis and make a design of scientific paper (training session: analysis data of various experiments)

5. Teaching and Learning Methods	
	- Lectures - scientific seminars and presentation - Laboratory training -Laboratory facilities

6.Teaching and Learning Methods (for students with special needs)	**Not applicable**

7.Student Assessment:	
a.Assessment Methods:	- Activities (seminar and term paper -Mid. Term exam -Oral Exam -Written Exam -
b.Assessment Schedule	Semester Works, Mid.term Exam (6th) Week, Practical exam (14th) Week, Written (Final) Exam (15th) Week.
c.Weighting of Assessments	**10/100…** **10/100** **10/100** **10/100.** **60/100**

8.List of References:	
Notes	**مذكرة غير منشورة**
Essential Books (Text Books)	4. -Dodds J.H. and Roberts L.W. Experiments in Plant tissue Culture, 3rd edition, Cambridge University Press, 1995.An introduction to plant tissue culture (1993)byM.K.Razdan, Oxford, Newdelhi 5. - A handbook of plant tissue culture by White, Philip R. (Philip Rodney), 1901-
Suggested Books	1. Singh B.D. Text Book of Plant Biotechnology, Kalyani Publishers, 1998. 2. Bhojwani S.S. and Razdan M.K. Plant Tissue Culture: Theory and Practice, a Revised Edition, Elsevier Science, 1996.
...Periodicals, Web Sites, … etc	

Course coordinator: **Dr Ebtsam moubark Hamza**
Head of Department: **Prof. Haroun Abou Shama**

Matrix of Knowledge, Skills ILOs for Education Courses
Experiments in plant tissue culture III (C-34)

Course Contents	Week No.	a Knowledge and Understanding	b Intellectual skills	c Practical and Professional Skills of course	d General and Transferable Skills
1. Experiments in solving physiological disorders.(training session: design and follow up experiment in factors affecting physiological disorders)	**1&2**	**a/1,2**	**b/1**	**c/2**	**d/1,2**
2. Experiments in production of free virus plants.	**3&4**	**a/1,2**	**b/4**	**c/1**	**d/2**
3. Experiments in micro-grafting (training session: training in mcrografting)	**5&6**	**a/1,2**	**b/4**	**c/2**	**d/3,4**
4. Experimen.ts in production bulbs *in vitro* and cryopreservation (training session: design a trail to produce microtubers)	**7&8**	**a/2**	**b/4**	**c/1**	**d/3**
5. Experiments in producing somatic embryos. (training session: follow up experiments)	**9&10**	**a/2**	**b/2,3**	**c/1**	**d/3**
6. Experiments in production of secondary metabolites.(training session: design a protocol for producing secondary metabolites)	**11&12**	**a/2**	**b/4**	**c/1**	**d/3**
7. Training in using analysis program for data analysis and make a design of scientific paper (training session: analysis data of various experiments)	**13&14**	**a/3**	**b/4**	**c/3**	**d/4**

Course coordinator: **Dr Ebtsam moubark Hamza**
Head of Department: **Prof. Haroun Abou Shama**

Department: **Plant biotechnology**

Course Specifications

32. Course information:							
Course Code:	C-89	**Course Title:**	Molecular methods in plant pathology I				
No. units	3	**Lec.**	2	**App.**	2	**Level**	M.Sc
Department	**Plant biotechnology**						

33. Course Aims	
	2/1 Determining different genes related to pathogen life cycle and gene expression. 2/2 Understanding the use of different molecular marker tools 2/3 Explaining different plant disease control mechanisms 2/4 Determining research subjects, collecting & developing information and applying analytical and critical approach to knowledge in the field of plant biotechnology.

34. Intended Learning Outcomes of Course (ILO's)	
yyy. Knowledge and Understanding:	a/1 Clarify difference between molecular markers and its application in plant pathology research a/2 Explain pathogen control methods under the Egyptian environment a/3 Express the fundamental of ethical and legal practice and their use in genetically modified plants a/4 Remolde the actual quality standards of the practical analysis and determination of plant biotechnology. a/5 Summarize basics of the various pathogen diagnosis methods.
zzz. Intellectual skills:	b/1 Determine problems in pathogen control related to plant biotechnology. b/2 Find solution for the majority of pathogens using

	different diagnostic tools. b/3 Suggest research studies that add knowledge to the existing plant biotechnology. b/4 Innovate solutions regarding pathogen control and the new arisen pathogen variants
aaaa. Practical and Professional Skills:	c/1 Select advanced professional skills in molecular markers c/2 Estimate methods to evaluate different control methods. c/3 Test the different analytical methods for analysis of pathogen genes. c/4 Diagnose of the plant diseases and different scientific problems in the field of plant biotechnology.
bbbb. General and Transferable Skills	d/1 Active communication by its different & effective methods. d/2 Using different resources for obtaining data, knowledge, and information in the field of plant biotechnology. d/3 Work in team; manage teams in different professional trends. d/4 Continuous self learning.

	6- Course Contents:
No.	**Topic**
1	Molecular genetics of plant pathogenic bacteria
2	Molecular genetics of plant pathogenic fungi
3	Molecular genetics of plant pathogenic viruses
4	Impacts of molecular diagnostic technologies on plant disease management
5	Molecular genetics of plant disease control
6	Genetic markers: RFLP, AFLP and Microsatellites
7	Genetic markers: DNA sequences and SNPs

7- Teaching and Learning Methods	
	4.1- Lectures 4.2- oral presentation 4.3- discussion 4.4- Laboratory Assignments

8- Teaching and Learning Methods (for students with special needs)	Not applicable

7. Student Assessment:	
a. Assessment Methods:	* Semester works, * Midterm exam, * Practical exam, * Oral exam, * Written (Final) exam.
b. Assessment Schedule	* 5th &10th works, * 6th week, * 14th week, * 15th week.
c. Weighting of Assessments	10degrees Ratios 10%, 10 degrees Ratios 10%, 20 degrees Ratios 20%, 60 degrees Ratios 60%, Total 100 degrees Ratios 100%.

9- List of References:	
lll. Notes	
mmm. Essential Books (Text Books)	Dickinson, M. 2003. Molecular Plant Pathology (Advanced Texts).
nnn. Suggested Books	Plant Viruses as Molecular Pathogens. Khan, J. A. and Dijkstra, J. eds. 2002. Food Products Press, N
ooo.Periodicals, Web Sites, … etc ...	www.helsinki.fi/~dguo/plvirus.htm www.virology.net/garryfavwebplant.html www.ingenta.com/ www.uct.ac.za/microbiology/tutorial/isometric_nuclearcapsids.htm www.els.net

Course coordinator :Dr. Amal Mahmoud
Head of the department council: Prof. Haroun Abou Shama
Date:

Matrix of Knowledge, Skills ILOs for Education Course C-89 Molecular methods in plant pathology I

Course Contents	Week No.	a-Knowledge and Understanding	b- Intellectual skills	c-Practical and Professional Skills of course	d-General and Transferable Skills
Molecular genetics of plant pathogenic bacteria	**1&2**	**a/5**	**b/3**	**c/3**	**d/1, d/3, d/4**
Molecular genetics of plant pathogenic fungi	**3&4**	**a/5**	**b/3**	**c/3**	**d/3, d/4**
Molecular genetics of plant pathogenic viruses	**5&6**	**a/5**	**b/3**	**c/3**	**d/3, d/4**
Impacts of molecular diagnostic technologies on plant disease management	**7&8**	**a/3, a/4**	**b/2**	**c/4**	**d/3, d/4**
Molecular genetics of plant disease control	**9&10**	**a/2**	**b/1, b/4**	**c/2**	**d/3, d/4**
Genetic markers: RFLP, AFLP and Microsatellites	**11&12**	**a/1**	**b/4**	**c/1**	**d/2, d/3, d/4**
Genetic markers: DNA sequences and SNPs	**13&14**	**a/1**	**b/4**	**c/1**	**d/2, d/3, d/4**

Course coordinators: Dr. Amal Mahmoud and Dr. Mostafa Alansary
Head of Department: Prof, Haroun Abou Shama