



**Zagazig University**  
**Faculty of Pharmacy**  
**Pharmacognosy Department**

**Program and Course Specifications**  
**Master and Ph.D.**  
**Degrees**

**2012/2013**

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# Master Degree

# Program Specification

## Program Specification

### A- Basic Information

- 1- **Program title:** M.Pharm. Sci Degree in **Pharmacognosy**
- 2- **Program type:** Monodisciplinary.
- 3- **Faculty/ University:** Faculty of Pharmacy, Zagazig University
- 4- **Department:** Pharmacognosy
- 5- **Coordinator:** Prof. Dr. Assem ElShazly
- 6- **Date of program specification approval:** 2012

### B- Professional Information

#### 1- Program aims:

The Pharmacognosy master's program aims to Provide postgraduate master students with a special and advanced education in the field of pharmacognosy, natural products chemistry and plant biotechnology and to enable postgraduate master students to gain the practical and laboratory skills required for experiments in pharmacognosy, natural products chemistry and plant biotechnology field.

#### 2-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for Pharmacognosy master of sciences degree.

##### 2-1- Knowledge and Understanding :

**On successful completion of the Master degree Program, students will be able to:**

A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology

A.2- Understand how and why medicinal plants affect human and diverse strategies for dealing with diseases.

A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.

A.4- Abide to values, moral, legal and religious issues of professional practice and research.

A.5- Determine the basics related to quality assurance in the field of pharmacognosy and related subjects.

A.6- Understand how to work according to ethical frameworks.

### **2-2 - Intellectual Skills:**

**On successful completion of the Master degree Program, students will be able to:**

B.1- Appraise critically the quality of data and information offered from different sources to solve problems.

B.2- Identify gaps or weaknesses in existing knowledge and identify appropriate means of resolving them.

B.3- Use information gained from different sources to solve complex problem solving.

B.4- Conduct research either individually or as a part of team through research design, data collection, analysis, synthesis and reporting.

B.5- Reduce and eliminate risks during professional practice.

B.6- Reflect critically on own performance and that of others and then take appropriate action to improve subsequent actions.

B.7- Take professional decisions and respond to experience and circumstances.

### **2-3 - Professional and Practical Skills:**

**It is intended that, on successful completion of the Master degree Program, students will be able to:**

C.1- Master a wide range of practical and laboratory skills in the field of pharmacognosy.

C.2- Review and summarize information in professional reports.

C.3- Conduct various methods and techniques of analysis related to pharmacognosy.

### **2-4 - General and Transferable Skills:**

**On successful completion of the Master degree Program, students will be able to:**

D.1- Apply effective communication skills recognizing the need for a variety of approaches.

D.2- Make effective use of information technology e.g. word processing, spread sheets, presentation soft ware, internet....etc.

D.3- Practice self assessment and define learning needs in the field of pharmacognosy.

D.4- Make effective use of library and other sources of information in the field of pharmacognosy.

D.5- Establish rules for judging others performance related to the pharmacognosy.

D.6- Work with and motivate others.

D.7- Prioritize work and meet deadlines.

D.8- Develop the skills required for continuing professional development.

### 3- Academic Standards:

- NARS (National Academic Reference Standards)

**Matrix:** Comparison between Master degree program ILOs and the National Academic Reference Standards

NARS vs. Program ILOs of Masters in Pharmacognosy		
	NARS	Program ILOs
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2- Understand how and why medicinal plants affect human and diverse strategies for dealing with diseases.
	2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.4- Abide to values, moral, legal and religious issues of professional practice and research.
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5- Determine the basics related to quality assurance in the field of pharmacognosy and related subjects.
	2.1.6- The fundamentals and ethics of scientific research.	A.6- Understand how to work according to ethical frameworks.
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Appraise critically the quality of data and information offered from different sources to solve problems.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Identify gaps or weaknesses in existing knowledge and identify appropriate means of resolving them.

	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Use information gained from different sources to solve complex problem solving.
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research either individually or as a part of team through research design, data collection, analysis, synthesis and reporting.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5- Reduce and eliminate risks during professional practice.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Reflect critically on own performance and that of others and then take appropriate action to improve subsequent actions.
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions and respond to experience and circumstances.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Master a wide range of practical and laboratory skills in the field of pharmacognosy.
	2.3.2- Write and evaluate professional reports.	C.2- Review and summarize information in professional reports.
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Conduct various methods and techniques of analysis related to pharmacognosy.
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Apply effective communication skills recognizing the need for a variety of approaches.
	2.4.2- Effectively use information technology in professional practices	D.2- Make effective use of information technology e.g. word processing, spread sheets, presentation soft ware, internet...etc.
	2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment and define learning needs in the field of pharmacognosy.
	2.4.4- Use variable sources to get information and knowledge.	D.4- Make effective use of library and other sources of information in the field of pharmacognosy

2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Establish rules for judging others performance related to the pharmacognosy.
2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work with and motivate others.
2.4.7- Manage time effectively.	D.7- Prioritize work and meet deadlines.
2.4.8- Continuous and self learning.	D.8- Develop the skills required for continuing professional development.

#### 4-Curriculum Structure and Contents:

**a- Program duration:** 3- 5 years

**b- Program structure:**

- The Masters program can be completed in 3-5 years.
- The Faculty of pharmacy implements the credit hour system.
- The program is structured as:

**1- Courses: General (1 year) and Special**

**No. of credit hours for program courses:**

Compulsory: 12

Elective: (2x4) 8

Special: (3x4) 12

**2- Thesis:** 30 hours

The candidate must complete a research project on an approved topic in the Pharmaceutical Sciences. To fulfill this requirement the student must present (written and orally) a research proposal and write a thesis.

**3- General University Requirements:** 10 credit hours including:

a- TOEFL (400 units)

b- Computer course

**c-Program Curriculum:**

<b>Course Code</b>	<b>Course Title</b>	<b>Credit hours</b>	<b>Program ILOs Covered</b>
	General Courses:		
M108	Advanced Taxonomy	4	A1, A3, B1 and D4
M113	Natural Products Biotechnology	4	A1, A3, B1, B3, B6, B7, D1 and D6
M107	Recent applications of plant tissue culture techniques	4	A1, A3, B1, D1 and D6
M101	Advanced Instrumental Analysis & chromatography I	4	A1, A2, B1, D4
ME3	Elective A Good practice for analysis of drugs and quality control	4	A1, A3, A5, B1, B5, D2, D4
ME2	Elective B Drug Stability	4	A1, A2, A5, B1, B2
	Special Courses:		
Gsp1	Advanced Chemistry of natural products	4	A1, A2, A3, B3, D1 and D6

Gsp3	Structure Determination of Natural Products	4	A1, A3, B1, B3 and D4
Gsp2	Methods in natural products research	4	A3, B1, B3, D1 and D6
	Thesis	30	A1, A2, A3, A4, A5, A6, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3, D1, D2, D3, D4, D5, D6, D7 and D8

### **5-Program admission requirements:**

- Candidate should have obtained the certificate of Bachelor degree in pharmaceutical sciences with general grade good and grade good in the specialty from one of the Egyptian universities or an equivalent certificate from a foreign institute recognized by the university.
- Admission is in October each year.

### **6- Admission Policy:**

The faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (ESCU).

### 7-Student assessment methods:

Method	ILOS
Written exam	Knowledge and Understanding and Intellectual Skills
Oral exam	Knowledge and Understanding ,Intellectual Skills and General and Transferable Skills
Activity	Intellectual Skills and General and Transferable Skills
Seminars	Knowledge and Understanding ,Intellectual Skills & General and Transferable Skills
Follow up	Professional and practical Skills & General and Transferable Skills
Thesis and oral presentation	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

Grade Scale	Grade point average value (GPA)	Numerical scale
A+	5	≥ 95%
A	4.5	90- < 95%
B+	4	85- < 90%
B	3.5	80- < 85%
C+	3	75- < 80%
C	2.5	70- < 75%
D+	2	65- < 70%
D	1.5	60- < 65%

## 8-Failure in Courses:

Students who fail to get 60% ( 1 point)

## 9-Methods of program evaluation

<b>Evaluator</b>	<b>Method</b>	<b>Sample</b>
<b>Internal evaluator:</b> Professor Dr. Sameeh El-Dahmy	Program evaluation Courses evaluation	Program report Courses report
<b>External evaluator:</b> Professor Dr. Said AboTabl	Program evaluation Courses evaluation	Program report Courses report
<b>Others methods</b>	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

**Program coordinator**  
**Prof. Dr. Assem ElShazly**

**Head of Department**  
**Prof. Dr. Sameeh El-Dahmy**

# Advanced Taxonomy

## Course specification of Advanced Taxonomy

### Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy Dept.
- Department offering the course: Pharmacognosy Dept.
- Academic year / level: Postgraduate
- Date of specification approval: 2012/2013

### 1- Basic information:

Title: Advanced Taxonomy

Code: M108

Lectures: 2 hrs/week

Credit hours: 2

Total: 2hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to classify medicinal plants families according to the external morphology, anatomy, cytotaxonomy, palynology, chemotaxonomy and serotaxonomy, recognize botanical library, herbarium, botanical grades and their importance and implement the use of taxonomy in medicinal plant research and industry.

### 3. Intended learning outcome s (ILOs) of Advanced

#### Taxonomy:

<b>Knowledge and Understanding</b>	
<b>a1</b>	Discuss the classification of the plant kingdom into phyta.
<b>a2</b>	List the plant families according to morphological and anatomical characters.
<b>a3</b>	Classify plants into families according to the composition of the flower.
<b>a4</b>	Understand the newer aspects of taxonomy based on chemical or genetic profiles.
<b>Intellectual skills</b>	
<b>b1</b>	Separate closely related species macroscopically and microscopically.
<b>b2</b>	Differentiate between closely related species by advanced taxonomy as serology, palynology, cytotaxonomy, and chemotaxonomy
<b>General and Transferable Skills</b>	
<b>d1</b>	Use the library and other sources of information

### 4. Course Content of Advanced Taxonomy:

<b>Week number</b>	<b>Lecture contents (2hrs/week)</b>
<b>1</b>	Introduction: Classification of plant kingdom
<b>2</b>	Classification of subphyla
<b>3</b>	Bryophytes and Pteridophyta .
<b>4</b>	Gymnosperms and Angiosperms
<b>5</b>	Monocot and Dicot families Activity
<b>6</b>	Modern trends in plant taxonomy: Floral anatomy and Cytology

7	Palynology.
8	Numerical taxonomy
9	Chemotaxonomy
10	Serotaxonomy
11	Botanical library Activity
12	Botanical gardens and paleobotany
13	Floral diagram, floral formula and floral anatomy
14	Classification of plants according to pharmacology and medicinal uses
15	Classification of plants according to pharmacology and medicinal uses

### **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- noissucsid nepO
- Activities

### **6- Student Assessment methods:**

Written exams to assess: a1, a2, a3, a4, b1 and b2

Oral exam assess: a1, a2, a3, a4, b1 and b2

Activity assess: d1

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 5-11
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## 7- References and books:

### A- Scientific papers

### B- Essential books:

- Janice glimn-Lacy and Peter B. Kaufman (2006) "Botany illustrated, introduction to plants, major groups, flowering plant families" 2<sup>nd</sup> edition, springer
- Botany" by Dr. Ashok M. Bendre and Dr. P.C. Pande.
- Plant Systematics" by Walter S. Judd (2007).
- Trease and Evans Pharmacognosy" by William Charles Evans (2009).
- Students' Flora of Egypt by Vivi Täckholm (1974).
- Plant Taxonomy" by O.P. Sharma(1993) .

### C- Suggested books:

- Introductory Botany" by Linda R. Berg (2000).
- Common families of flowering plants" by Michael Hickey and Clive King (1997).

### D- Websites:

[www.organicworldwide.net](http://www.organicworldwide.net)

[www.wikipedia.org](http://www.wikipedia.org)

[www.google scholar.com](http://www.google scholar.com)

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer, data show.

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- **Course Coordinators: Prof Dr/ Ehsan Abou Zaid**
  - **Head of Department: Prof Dr/ Sameeh El-Dahmi**
  - **Date: 2012-11 تم اعتماد التوصيف بمجلس القسم**

Matrix I of Advanced Taxonomy course								
Week number	Course Contents	Knowledge and understanding				Intellectual skills		General and Transferable Skills
		a1	a2	a3	a4	b1	b2	d1
1	Introduction: Classification of plant kingdom	x						
2	Classification of subphyla	x						
3	Bryophytes and Pteridophyta .	x						
4	Gymnosperms and Angiosperms	x						
5	Monocot and Dicot families Activity	x						x
6	Modern trends in plant taxonomy: Floral anatomy and Cytology		x			x		
7	Palynology.			x			x	
8	Numerical taxonomy				x		x	
9	Chemotaxonomy				x		x	
10	Serotaxonomy				x		x	
11	Botanical library Activity			x				x
12	Botanical gardens and paleobotany							
13	Floral diagram, floral formula and floral anatomy			x				
14	Classification of plants according to pharmacology and medicinal uses	x	x	x	x	x	x	
15	Classification of plants according to pharmacology and medicinal uses	x	x	x	x	x	x	

Matrix II of Advanced Taxonomy

NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment			
					Lectures	Self learning	Written exam	Oral exam	Activity	
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology.	a1	Classification of plant kingdom, thallophyta	Scientific papers, text books and Internet	x	x	X	X	
				Classification of subphyla algae, fungi and lichens.	Scientific papers, text books and Internet	x	x	X	X	
				Pteridophyta: subphyla Filicinae and Lycopodiinae. Differences between gymnosperms and angiosperms	Scientific papers, text books and Internet	x	x	X	X	
				Differences between monocots and dicots	Scientific papers, text books and Internet	x	x	X	X	
				Examples of monocot and dicot families.	Scientific papers, text books and	x	x	X	X	

				Internet					
		a2	Modern trends in plant taxonomy: External morphology, vegetative anatomy	Scientific papers, text books and Internet	x	x	X	X	
		a3	Floral anatomy, cytology and palynology.	Scientific papers, text books and Internet	x	x	X	X	
			Botanical library (role, major ones in the world), herbarium (definition, modern herbarium, examples in the world, precautions for use herbarium)	Scientific papers, text books and Internet	x	x	X	X	
			Floral diagram and floral formula and activity	Scientific papers, text books and Internet	x	x	X	X	
2.1.3- Scientific	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	a4	Numerical taxonomy (principles, advantages, applications)	Scientific papers, text books and Internet	x	x	X	X	
			Chemotaxonomy (definition, purpose, chemical classes)	Scientific papers, text	x	x	X	X	

	developments in the area of specialization.				books and Internet					
				Serotaxonomy (definition, general features, general purposes )	Scientific papers, text books and Internet	x	x	X	X	
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Appraise critically the quality of data and information offered from different sources to solve problems.	b1	Modern trends in plant taxonomy: External morphology, vegetative anatomy	Scientific papers, text books and Internet	x	x	X	X	
			b2	Floral anatomy, cytology and palynology.	Scientific papers, text books and Internet	x	x	X	X	
				Numerical taxonomy (principles, advantages, applications)	Scientific papers, text books and Internet	x	x	X	X	
				Chemotaxonomy (definition, purpose, chemical classes)	Scientific papers, text books and Internet	x	x	X	X	

				Serotaxonomy (definition, general features, general purposes )	Scientific papers, text books and Internet	x	x	X	X	
<b>General and Transferable Skills</b>	2.4.4- Use variable sources to get information and knowledge.	D.4- Make effective use of library and other sources of information in the field of pharmacognosy	d1	Activity	Scientific papers, text books and Internet		x			x

# Natural Products Biotechnology

## Course specification of Natural Products Biotechnology

### Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy Dept.
- Department offering the course: Pharmacognosy Dept.
- Date of specification approval: 2012/20123

### 1- Basic information:

**Title:** Natural Products Biotechnology

**Code:**M113

**Lectures:** 4 hrs/week

**Credit hours:** 4 hrs

**Total:** 4 hrs/week

### 2- Overall aim of the course:

On completion of this course, the student is expected to have the necessary knowledge, understanding and gain the competent skills about the fundamentals and advanced applications in the field of tissue culture, biotransformation and molecular biology that affect the production of pharmaceutical products.

### 3. Intended learning outcome s (ILOs) of Natural Products

#### Biotechnology:

<b>Knowledge and Understanding</b>	
<b>a1</b>	Recall the principles and core concepts of tissue culture , biocatalysis, and genetic engineering
<b>a2</b>	Define the technical terms used in advanced genetic engineering ,biocatalysis and tissue culture applications .
<b>a3</b>	Memorize the basic concepts in nucleic acids, genes and enzymes
<b>a4</b>	Recognize how to manage and exploit knowledge of DNA cloning, recombinant DNA, and related applications.
<b>a5</b>	Mention the mechanisms regulating of gene expression biotechnology and understanding the functions of specific gene products
<b>Intellectual skills</b>	
<b>b1</b>	Predict the mechanism of actions behind the biocatalysis of natural products.
<b>b2</b>	Create an appropriate procedures for isolation, purification of specified gene and plasmid..
<b>b3</b>	Interpret the molecule-DNA interaction and its application in modifying or production of novel active components.
<b>b4</b>	Analyze and interpret qualitative data in a suitable form
<b>General and Transferable Skills</b>	
<b>d1</b>	Work effectively as a member of a team.
<b>d2</b>	Develop internet communications skills.

#### 4. Course Content of Natural Products Biotechnology:

Weeks	Lecture
1	General introduction to natural products biotechnology
2	Recent advances in tissue cultures
3	Selected types of enzymatic bioconversions of pharmaceutically important natural products.
4	Methods of biocatalyst immobilization.
5	Bioreactors.
6	Applications of bioconversions in the field of nat. prod.
7	Applications of bioconversions in the field of nat. prod.( <i>cont</i> )
8	Concept maps of genetic engineering
9	Plant breeding versus genetically modified ones Horizontal and vertical gene transfer.
10	Insertion of gene into medicinal (recipient organism ) plant
11	Synthetic seeds
12	Molecular markers and their impact on medicinal- plants bioactive products.
13	Application of genetic engineering in the field of natural products.
14	Application of genetic engineering in the field of natural products ( <i>cont.</i> )
15	<b>Revision</b>

#### 5- Teaching and Learning Methods:

- Lectures
- Self learning
- noissucsid nepO

#### 6- Student Assessment methods:

Written exams to assess: a1, a2, a3, a4, a5, b1to b4

Oral exam assess: a1, a2, a3, a4, a5, b1to b4

Activity assess: d1, d2

**Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 5-11
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

**Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

**7- References and books:**

**A-Scientific papers**

**B- Essential books:**

- Molecular Biology ; Robert F. Weaver ; Mc Graw-Hill; Fifth Ed.(2012).
- Textbook of Industrial Pharmacognosy; A.N.Kalia ;CBS(2009).
- Pharmaceutical Biotechnology; S.S.Purohit,H.N.Kakrani and A.K.Saluja; Agrobios (2006)
- Pharmaceutical Biotechnology. Crommelin, D.A.; and Sindeler, R.D. Hartwood Academic Publishers. The Netherlands. (1997)
- Pharmacognosy and Pharmacobiotechnology. J.E. Robbers, Marilyn K.Speedi and Varr E.Taylor;William &Wilkins(1996)

- Plant Gene Isolation; principles and practice; Gary D. Foster and David Twell ; John Wiley & Sons Ltd. (1996).

#### C- Suggested books:

- Pharmacognosy and Pharmacobiotechnology. J.E.Robbers, Marilyn K.Speeddi and VarrE.Taylor; William & Wilkins(1996)
- Plant gene isolation; principles and practice; GaryD.Foster and David Twell; John Wilew & Sons Ltd. (1996).

#### D- Websites:

##### Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

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- **Course Coordinators: Prof . Dr. Azza El- Shafae**
  - **Head of Department: Prof Dr/ Sameeh El-Dahmi**
  - **Date: 2012-11 تم اعتماد التوصيف بمجلس القسم**

Matrix I of Natural Product Biotechnology												
Course Contents		ILOs of Natural Product Biotechnology										
		Knowledge and understanding					Intellectual skills				General and Transferable Skills	
		a1	a2	a3	a4	a5	b1	b2	b3	b4	d1	d2
1	General introduction to natural products biotechnology	X										
2	Recent advances in tissue cultures	X										
3	Selected types of enzymatic bioconversions of pharmaceutically important natural products.	X					X					
4	Methods of biocatalyst immobilization.		X									
5	Bioreactors.		X								X	X
6	Applications of bioconversions in the field of nat. prod.		X									
7	Applications of bioconversions in the field of nat. prod.(cont)	X							X			
8	Concept maps of genetic engineering	X										
9	Plant breeding versus genetically modified ones Horizontal and vertical gene transfer.	X	X					X	X			
10	Insertion of gene into medicinal (recipient organism ) plant		X									
11	Synthetic seeds			X	X						X	X
12	Molecular markers and their impact on medicinal- plants bioactive products.				X	X		X	X			
13	Application of genetic engineering in the field of natural products.					X		X		X		
14	Application of genetic engineering in the field of natural products (cont.)					X		X		X		
15	Revision	X	X	X	X	X	X	X	X	X	X	X

## Matrix II of Natural Product Biotechnology

NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
					Lectures	Self learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	a1	General introduction to NB Biotechnology	Scientific papers, text book and Internet	x	x	x	x	
			Fundamentals of NB biotransformations and green biocatalysis Introduction to enzymes selectivity	Scientific papers, text book and Internet	x	x	x	x	
			Enzymes selectivity Pathways and non-specific conversions Selected types of enzymatic bioconversions involving natural products	Scientific papers, text book and Internet	x	x	x	x	
			Applications of bioconversions in the field of nat. prod.	Scientific papers, text book and Internet	x	x	x	x	

				General introduction to genetic engineering (concept maps )	Scientific papers, text book and Internet	x	x	x	x	
				Plant genetic engineering ,basic concepts Plant breeding versus genetically modified ones.	Scientific papers, text book and Internet	x	x	x	x	
		a2		Enzyme immobilization	Scientific papers, text book and Internet	x	x	x	x	
				Cell permealization and viability Bioreactors.	Scientific papers, text book and Internet	x	x	x	x	
				Phytoremediation and enzyme debittering	Scientific papers, text book and Internet	x	x	x	x	
				Plant genetic engineering ,basic concepts Plant breeding versus genetically modified ones.	Scientific papers, text book and Internet	x	x	x	x	
				Horizontal and vertical gene transfer	Scientific papers, text book and Internet	x	x	x	x	

			a3	introduction of gene into medicinal (recipient organism ) plant	Scientific papers, text book and Internet	x	x	x	x	
			a4	introduction of gene into medicinal (recipient organism ) plant	Scientific papers, text book and Internet	x	x	x	x	
				Components and procedures of a typical cloning experiment. Markers in molecular biology and impact on medicinal plants bioactive products.	Scientific papers, text book and Internet	x	x	x	x	
			a5	Components and procedures of a typical cloning experiment. Markers in molecular biology and impact on medicinal plants bioactive products.	Scientific papers, text book and Internet	x	x	x	x	
				Application of genetic engineering in the field of natural products	Scientific papers, text book and Internet	x	x	x	x	

Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Appraise critically the quality of data and information offered from different sources to solve problems.	b1	Enzymes selectivity Pathways and non-specific conversions Selected types of enzymatic bioconversions involving natural products	Scientific papers, text book and Internet	x	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Synthesise information from disparate sources and use to inform complex problem solving.	b3	Plant genetic engineering ,basic concepts Plant breeding versus genetically modified ones.	Scientific papers, text book and Internet	x	x	x	x	
				Components and procedures of a typical cloning experiment. Markers in molecular biology and impact on medicinal plants bioactive products. Applications of bioconversions in the field of nat. prod.	Scientific papers, text book and Internet	x	x	x	x	
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Reflect critically on own performance and that of others and then take appropriate action to improve subsequent actions.	b2	Plant genetic engineering ,basic concepts Plant breeding versus genetically modified ones.	Scientific papers, text book and Internet	x	x	x	x	
				Components and procedures of a typical cloning experiment. Markers in molecular biology and impact on medicinal plants bioactive products.	Scientific papers, text book and Internet	x	x	x	x	

				Application of genetic engineering in the field of natural products	Scientific papers, text book and Internet	x	x	x	x	
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions and respond to experience and circumstances.	b4	Application of genetic engineering in the field of natural products	Scientific papers, text book and Internet	x	x	x	x	
<b>General and Transferable Skills</b>	2.4.1- Communicate effectively.	D.1- Apply effective communication skills recognizing the need for a variety of approaches.	d1	Activities	Scientific papers, text book and Internet		x			x

	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work with and motivate others.	d2	Activities	Scientific papers, text book and Internet		x			x
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# Recent applications of plant tissue culture techniques

## Recent applications of plant tissue culture techniques

### A- Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy Dept.
- Department offering the course: Pharmacognosy Dept.
- Academic year level: Postgraduate
- Date of specification approval: 2012/2013

### 1- Basic information:

Title: Recent applications of Plant Tissue Culture techniques  
Code: M107 Credit hours: 2 hrs/week  
Lectures: 2 hrs/week Total: 2 hrs/week

### 2- Overall aim of the course:

The students, on completion of the course, will be able to know plant tissue culture techniques as a tool for producing new secondary metabolites in the plant and increasing the amount of already existing materials which have valuable medicinal uses. This course will also help students to understand biosynthesis of natural products and how to use plant tissue culture as a tool to save the medicinal plant flora through micropropagation techniques.

### 3. Intended learning outcome s (ILOs):

<b>Knowledge and Understanding</b>	
<b>a1</b>	Define tissue culture and different factors affecting it.
<b>a2</b>	Describe different types of culture, phytohormones and media components.
<b>a3</b>	Explain plant regeneration and micropropagation and their applications.
<b>a4</b>	Discuss the influence of plant tissue cultures in the field of production of secondary metabolites.
<b>a5</b>	Discuss the design of plant tissue culture lab.
<b>Intellectual skills</b>	
<b>b1</b>	Classify different types of plant growth regulators.
<b>b2</b>	Compare between different culture types.
<b>b3</b>	Analyze the effect of different factors on the production of secondary metabolites using plant tissue culture techniques
<b>General and Transferable Skills</b>	
<b>d1</b>	Develop useful communication skills
<b>d2</b>	Make use of different sources of information in the field of tissue culture

#### **4. Course Content of Plant Tissue Culture Techniques:**

<b>Week number</b>	<b>Lecture contents (2hrs/week)</b>
<b>1</b>	Introduction: Tissue culture definition
<b>2</b>	Medium component: Macroelements, Microelements and other components
<b>3</b>	Plant growth regulators: hormones and applications
<b>4</b>	Culture types: Callus, cell suspension and protoplast
<b>5</b>	Culture types: Hairy root cultures
<b>6</b>	Plant regeneration: somatic embryogenesis
<b>7</b>	Plant regeneration: organogenesis
<b>8</b>	Micropropagation: definition and stages
<b>9</b>	Micropropagation: applications
<b>10</b>	General plant tissue culture laboratory design
<b>11</b>	Practical techniques used for plant tissue culture
<b>12</b>	Production of the secondary metabolites by tissue culture: techniques used
<b>13</b>	Application for production of the secondary metabolites by plant tissue culture (activities)
<b>14</b>	Application for production of the secondary metabolites by plant tissue culture (activities)
<b>15</b>	Open discussion

#### **5- Teaching and Learning Methods:**

- Lectures
- Self learning: Internet and library activities

## **6- Student Assessment methods:**

Written exams to assess: a1, a2, a3, a4, a5, b1to b3

Oral exam assess: a1, a2, a3, a4, a5, b1to b3

Activity assess: b3, d1, d2

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 13-14
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

<b>Assessment method</b>	<b>Marks</b>	<b>Percentage</b>
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## **7- References and books:**

### **A-Scientific papers**

### **B- Essential books:**

- Trigiana RN and Gray D (2000) “Plant tissue culture concepts and laboratory exercises” CRC press, Florida, USA.
- Smith R. H. (2000) “Plant Tissue Culture, Second Edition: Techniques and Experiments” Academic press, Florida, USA.

### C- Suggested books:

- Adrian Slater, Nigel W. Scott, Mark R. Fowler (2008) “Plant Biotechnology: The Genetic Manipulation of Plants” Second addition, oxford University press, NewYork, USA

### D- Websites:

<http://www.ncbi.nlm.nih.gov/>

<http://www.sciencedirect.com/>

<http://wokinfo.com/>

[http://thomsonreuters.com/products\\_services/science/science\\_products/a-z/web\\_of\\_science/](http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/)

### Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

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- **Course Coordinators:** Prof Dr/ Ehsan Abo Zied
  - **Head of Department:** Prof Dr/ Sameeh El-Dahmi
  - **Date:** 2012-11 تم اعتماد التوصيف بمجلس القسم

Matrix I of Plant tissue culture techniques											
Week number	Courses Contents	ILOs of Plant tissue culture techniques course									
		Knowledge and understanding					Intellectual skills			General and Transferable Skills	
		a1	a2	a3	a4	a5	b1	b2	b3	d1	d2
1	Introduction: Tissue culture definition	X									
2	Medium component: Macroelements, Microelements and other components		X								
3	Plant growth regulators: hormones and applications		X				X				
4	Culture types: Callus, cell suspension and protoplast		X					X			
5	Culture types: Hairy root cultures		X								
6	Plant regeneration: somatic embryogenesis			X							
7	Plant regeneration: organogenesis			X							
8	Micropropagation: definition and stages			X							
9	Micropropagation: applications			X							
10	General plant tissue culture laboratory design					X					

11	Practical techniques used for plant tissue culture					X					
12	Production of the secondary metabolites by tissue culture: techniques used				X				X		
13	Application for production of the secondary metabolites by plant tissue culture (activities)				X				X	X	X
14	Application for production of the secondary metabolites by plant tissue culture (activities)				X				X	X	X
15	Open discussion	X	X	X	X	X				X	X

Matrix II of Plant tissue culture techniques										
NARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self learning	Written exam	Oral	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology.	a1	Introduction: Tissue culture definition	Scientific papers, text books and Internet	x	x	x	x	
			a2	Medium component: Macroelements, Microelements and other components	Scientific papers, text books and Internet	x	x	x	x	
				Plant growth regulators: hormones and applications	Scientific papers, text books and Internet	x	x	x	x	
				Culture types: Callus, cell suspension and protoplast	Scientific papers, text books and Internet	x	x	x	x	
				Culture types: Hairy root cultures	Scientific papers, text books and	x	x	x	x	

				Internet					
			a3	Plant regeneration: somatic embryogenesis	Scientific papers, text books and Internet	x	x	x	x
				Plant regeneration: organogenesis	Scientific papers, text books and Internet	x	x	x	x
				Micropropagation: definition and stages	Scientific papers, text books and Internet				
				Micropropagation: applications					
2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	a4	Production of the secondary metabolites by tissue culture: techniques used	Scientific papers, text books and Internet	x	x	x	x	
			Application for production of the secondary metabolites by plant tissue culture (activities)	Scientific papers, text books and Internet	x	x	x	x	

			a5	General plant tissue culture laboratory design	Scientific papers, text books and Internet	x	x	x	x	
				Practical techniques used for plant tissue culture	Scientific papers, text books and Internet	x	x	x	x	
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Appraise critically the quality of data and information offered from different sources to solve problems.	b1	Plant growth regulators: hormones and applications	Scientific papers, text books and Internet	x	x	x	x	
			b2	Culture types: Callus, cell suspension and protoplast	Scientific papers, text books and Internet	x	x	x	x	
			b3	Production of the secondary metabolites by tissue culture: techniques used	Scientific papers, text books and Internet	x	x	x	x	
				Application for production of the secondary metabolites by plant tissue culture (activities)	Scientific papers, text books and Internet	x	x	x	x	x

General and Transferable Skills	D.1- Apply effective communication skills recognizing the need for a variety of approaches.	d1	Application for production of the secondary metabolites by plant tissue culture (activities)	activity	x	x			x
	D.4- Make effective use of library and other sources of information in the field of pharmacognosy.	d2	Application for production of the secondary metabolites by plant tissue culture (activities)	activity					x

# Courses offered by other departments

## Course specification of Advanced Instrumental Analysis & chromatography I

### A- Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy
- Department offering the course: Medicinal chemistry Dept.
- Date of specification approval: 2012/2013

### 1- Basic information:

Title: **Advanced Instrumental Analysis & chromatography I**

Code: M101

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4 hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to demonstrate fundamental knowledge and basic theories in instrumental analysis, state the concepts of diagnosing cardiac diseases, G.I.T diseases and infections through IR, HNMR and UV spectrophotometry and state the basic principles of (HPLC), HPLC/Mass, Gas Chromatography (GC) and GC/Mass and their medicinal applications.

### 3. Intended learning outcomes (ILOs) of Advanced Instrumental Analysis & chromatography I

<b>Knowledge and Understanding</b>	
<b>a1</b>	Illustrate properly theories of different instruments used in analysis
<b>a2</b>	State medicinal and pharmaceutical applications of spectroscopy , HPLC and GC
<b>Intellectual skills</b>	
<b>b1</b>	Analyze & interpret qualitative & quantitative data obtained from instrumental analysis
<b>General and Transferable skills</b>	
<b>d1</b>	Write reports and present it.

### 4. Course Content of Advanced Instrumental Analysis & chromatography I:

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
1	Ultra-violet spectroscopy
2	Vibrational spectroscopy (IR spectroscopy )
3	Nuclear magnetic resonance (NMR)
4	Mass spectrometry(MS)
5	Medicinal application of spectroscopy in diagnosis of diseases
6	Surface analysis
7	Liquid chromatography <b>Activity (Reports)</b>
8	HPLC & its theory
9	HPLC & its medicinal and pharmaceutical application
10	Gas chromatography its theory
11	GC & its medicinal and pharmaceutical application
12	Supercritical fluid chromatography (SFC)
13	Capillary electrophoresis(CE)
14	Analytical application of polymers <b>Activity (Reports)</b>
15	Revision & open discussion

## 5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

## 6- Student Assessment methods:

Written exams to assess: a1,a2&b1

Oral exams to assess: a1, a2&b1

Activities to asses: b1&d1

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 7-14
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

<b>Assessment method</b>	<b>Marks</b>	<b>Percentage</b>
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## 7- References and books:

### **A-Scientific papers**

### **B- Essential books:**

-Chemical stability of pharmaceuticals, Kenneth A. Connors, Kenneth Antonio Connors, Gordon L. Amidon, Valentino J. Stella

-Pharmaceutical process validation Robert A. Nash, Alfred H. Wachter (2006)

### **C- Suggested books:**

- Photostability of drugs and drug formulations, Hanne Hjorth Tønnesen ( 2004)
- U.S.P. & B.P (2010)

**D- Websites:**

- <http://www.ncbi.nlm.nih.gov/sites/entrez>
- <http://journals.tubitak.gov.tr/chem/index.php>
- <http://www.pharmacopoeia.co.uk/>
- [www.Pubmed.Com](http://www.Pubmed.Com)
- [www.sciencedirect.com](http://www.sciencedirect.com)

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer and data show.

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- **Course Coordinators: Prof. Dr. Al Sayed Lashen**
  - **Head of Department: Prof. Dr/Mansour Abo kull**
  - **Date: 2012-9-3 تم اعتماد التوصيف بمجلس القسم**

## Course specification of Drug stability

### A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmacognosy
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2012/2013

### 1- Basic information:

Title: **Drug stability**  
Lectures: 4 hrs/week  
Total: 4 hrs/week

Code: ME2  
Credit hours: 4 hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to describe the degradation of drugs and the methods to determine the order of reaction, Illustrate the stability programs for pharmaceutical products and the latest regulations for stability testing and gain the ability to predict the degradation pathways of a drug design a stabilization protocol and predict a product shelf-life.

### 3- Intended learning outcome s (ILOs) of Drug stability:

<b>Knowledge and Understanding</b>	
<b>a1</b>	Illustrate the principles of order of reactions and methods of determination order of reactions
<b>a2</b>	Describe the principles of physical and chemical degradation of drugs in different dosage forms
<b>a3</b>	Mention stability testing of different dosage forms
<b>Intellectual skills</b>	
<b>b1</b>	Suggest suitable stabilization methods for drugs in the various dosage forms.
<b>b2</b>	Design in a self-directed and original research investigations on drug stability in dosage forms from degradation pathways
<b>General and Transferable skills</b>	
<b>d1</b>	Demonstrate critical thinking and decision making during pharmaceutical preparations

### 4. Course Content of Drug stability:

<b>Week number</b>	<b>Lecture content (4 hr/w)</b>
1	<ul style="list-style-type: none"> <li>• Rate of chemical reactions</li> </ul>
2	<ul style="list-style-type: none"> <li>• Orders of reactions</li> <li>• Zero order</li> </ul>
3	<ul style="list-style-type: none"> <li>• First order</li> </ul>
4	<ul style="list-style-type: none"> <li>• Second order</li> </ul>
5	<ul style="list-style-type: none"> <li>• Apparent zero order reaction</li> <li>• Pseudo first order reaction</li> </ul>
6	<ul style="list-style-type: none"> <li>• Determination of order of reaction</li> <li>• -Substitution method</li> </ul>
7	<ul style="list-style-type: none"> <li>• Graphical method <b>(Presentation)</b></li> </ul>
8	<ul style="list-style-type: none"> <li>• Half-life method</li> </ul>
9	<ul style="list-style-type: none"> <li>• Routes of degradation</li> <li>• -Hydrolysis</li> <li>• -Oxidation</li> </ul>
10	<ul style="list-style-type: none"> <li>• -Photochemical degradation</li> <li>• -Incompatibility</li> </ul>

11	<ul style="list-style-type: none"> <li>Physical degradation routes</li> <li>-Vaporization</li> <li>-Aging</li> <li>- adsorption</li> </ul>
12	<ul style="list-style-type: none"> <li>Complex reactions</li> </ul>
13	<ul style="list-style-type: none"> <li>Stability testing</li> </ul>
14	<ul style="list-style-type: none"> <li>Revision</li> </ul>
15	<ul style="list-style-type: none"> <li>Open discussion <b>(Final Presentation)</b></li> </ul>

### 5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

### 6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1, b2

Oral exam to assess: a1, a2, a3, b1, b2, d1

Activities to assess: b1, b2, d1

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 7-15
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## **7- References and books:**

### **A- Essential books:**

Drug Stability: Principles and Practices (Drugs and the Pharmaceutical Sciences) by Jens T. Carstensen and Christopher Rhodes (2000).

### **B- Suggested books:**

Handbook of Stability Testing in Pharmaceutical Development: Regulations, Methodologies, and Best Practices, Kim Huynh-Ba, 389 (2008).

### **C- Websites:**

Pubmed, Sciencedirect, Wileyinterscience

### **Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, data show.

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- **Course Coordinators:** Dr/ Hanaa Abd El-Fattah El-Ghamry
  - **Head of Department:** Prof Dr/ Mahmoud Abdul-Ghany Mahdy
  - **Date:** 2012-9-3 تم اعتماد التوصيف بمجلس القسم

## Course specification of Good practice for analysis of drugs and quality control

### A- Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy
- Department offering the course: Medicinal chemistry Dept.
- Date of specification approval: 2012/2013

### 1- Basic information:

Title: **Quality in Instrumental Analysis and Quality Control**

Code: ME3

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4 hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to choose & develop suitable analytical methodology, analyze and find an effective solution for a given complex problem.

### 3. Intended learning outcome s (ILOs) of Good practice for analysis of drugs and quality control

<b>Knowledge and Understanding</b>	
<b>a1</b>	Outline the principles of drug analysis & quality control
<b>a2</b>	Express up-to-date information in the field of drug analysis
<b>a3</b>	Illustrate the basics in quality control & quality assurance
<b>Intellectual skills</b>	
<b>b1</b>	Analyze & evaluate obtained results qualitatively & quantitatively
<b>b2</b>	Evaluate GMP to avoid any hazards
<b>General and Transferable Skills</b>	
<b>d1</b>	Improve professional abilities by evaluation of information from different sources.
<b>d2</b>	Write reports and present it.

### 4. Course Content of Quality in Instrumental Analysis and Quality Control

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
1	Good Manufacture Practice (GMP)
2	Application of quantitative analysis
3	Quality control
4	Quality assurance
5	Applications of Spectrophotometric analysis for dosage forms <b>Activity</b>
6	H1,C13,N15,F19 NMR
7	Advanced techniques in mass spectroscopy
8	Atomic absorption
9	Fluorimetric analysis
10	Radioimmune Assay
11	Electrophoresis
12	GC-MS chemistry <b>Activity</b>
13	Spectrodenistometric (TLC scanner)
14	Forensic chemistry
15	Revision & Open Discussion

## 5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

## 6- Student Assessment methods:

Written exams to assess: a1, a2, a3,b1,b2,d1&d2

Oral exams to assess: a1, a2, a3,b1,b2,d1&d2

Activities to assess: d1&d2

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 5-12
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

<b>Assessment method</b>	<b>Marks</b>	<b>Percentage</b>
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## 7- References and books:

### **A-Scientific papers**

### **B- Essential books:**

Halpern,A in "Experimental physical chemistry"(2007)

Oxtoby,D and Nachtrieb, N in "Principles of Modern chemistry"(2009)

### **C- Suggested books**

Garfied, F .M., Klesta ,E and Hirsch, J in" Quality Assurance Principles for Analytical Laboratories"(2011)

**D- Websites:**

<http://www.ncbi.nlm.nih.gov/sites/entrez>

<http://journals.tubitak.gov.tr/chem/index.php>

<http://www.pharmacopoeia.co.uk/>

[www.Pubmed.Com](http://www.Pubmed.Com)

[www.sciencedirect.com](http://www.sciencedirect.com)

**Facilities required for teaching and learning:**

**For lectures:** Black (white) boards, data show.

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- **Course Coordinators: Prof.Dr/ Sobhy ElAdl**  
**Prof.Dr/ Mohammed Baraka**
- **Head of Department: Prof.Dr/ Mansour Abo kull**
- **Date: 2012-9-3 تم اعتماد التوصيف بمجلس القسم**

# Special Courses

# Advanced Chemistry of Natural Products

## Course specification of Advanced Chemistry of natural products

### Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy Dept.
- Department offering the course: Pharmacognosy Dept.
- Date of specification approval: 2012/2013

### 1- Basic information:

**Title:** Advanced Chemistry of natural products                      **Code:** GSP1  
**Lectures:** 4 hrs/week                                                              **Credit hours:** 4 hrs  
**Total:** 4hrs/week

### 2- Overall aim of the course:

By the end of the Chemistry of natural products course, the student will acquire the knowledge and understanding of different classes of the natural products as well as its chemical conversions and their biological activates.

### 3. Intended learning outcomes (ILOs) Advanced Chemistry of natural products

<b>A- Knowledge and Understanding</b>	
a1	Describe the general physical and chemical characters of different natural products.
a2	Outline the principle of isolation, purification and identification of different natural products.
a3	Mention the pharmacological activity of different natural products.
<b>B- Intellectual skills</b>	
b1	Comprehend and apply GLP, GPMP, GSP and GCP guidelines in pharmacy practice concerning with natural product research.
b2	Select the appropriate methods of isolation, purification, identification and standardization of active substances from different origins.
<b>D- General and Transferable skills</b>	
d1	Work effectively as a member of a team.
d2	Develop internet communications skills.

### 4. Course Content of Advanced Chemistry of natural products:

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
1	The Origin and the Nature of Natural Products
2	Plant-Derived Natural Products As a Source of Drug Discovery and Development
3	Plant and Brain Cannabinoids: The Chemistry of phytocannabinoids

4	Bioactive marine metabolite from red sea water
5	Toxins of Marine Invertebrates and Microorganisms Activities
6	Chemistry of the irregular monoterpenes
7	Chemistry of diterpenes .
8	Natural Products for Pest Management
9	Recent Advances in the Chemistry of Insect Pheromones and their applications.
10	Recent Trends of Some Natural Sweet Substances from Plants .
11	Natural Antioxidant ( NAO) of plants acting as scavengers of free radicals
12	Potential Anticancer Natural Products from Plant-Associated Fungi
13	Plant Fungal Endophytes: Interactions, Metabolites and Biosyntheses
14	Nature Derived Antibiotics
15	Activities

### **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- noissucsid nepO

### **6- Student Assessment methods:**

Written exams to assess: a1, a2, a3, b1and b2

Oral exam assess: a1,a2, a3, b1and b2

Activity assess: d1, d2

### Assessment schedule:

<b>Assessment (1):</b> Activity	Week 5-15
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## 7- References and books:

### A-Scientific papers

### B- Essential books:

- Studies in Natural product chemistry ,Uta Elrahman , Elsevier press, (2012)
- Introduction To Natural product Chemistry ,R.Xu Yang Ye,W. Zhao., CRC. Press,( 2011)
- Selected Topics in the Chemistry of Natural products,P.Ikan,World Scientific Press. ( 2008 )
- Comprehensive Natural Products Chemistry; Barton, D and Nakanishi, K, El sevier Science Ltd. (t 999).
- Natural Products Chemistry; Torssel, K. B. G. :Apotekars.press (1997).
- Natural Products from Plants; Kaufmann, P. B et al; CRC Press (1999). iv-Pharmacognosy and Pharmacobiotechnology; Robbers, J.

E., Speed ie, M. K. and Tyler. V.E.; Williams &Wilkins (1996).

### C- Suggested books:

- The Hand Books of Natural Flavonoids; Harborne, J. B. and Baxter, H.; John Wiley & Sons Ltd. (1999).
- Natural Products Isolation; Canell ,R.J. P ,Humana Press. (1998).
- Phytochemical Resources for Medicine and Agriculture; Nigg, H. N. and Seigler, D.; Plenum Press (1992).
- Medicinal Natural Products; A Biosynthetic Approach. Dewick, P.M.; John Wiley & Sons.

### D- Periodicals and Websites:

- Fitotherapia, Die Pharmazie, Journal of Natural Products, Phytochemistry, Planta medica

### Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

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- **Course Coordinators: Prof Dr/ Sameeh I. eldahmy**

- **Head of Department: Prof Dr/ Sameeh El-Dahmi**

- **Date: 2012-11**

تم اعتماد التوصيف بمجلس القسم

Matrix I of Advanced Chemistry of natural products course								
Week number	Course Contents	Knowledge and understanding			Intellectual skills		General and Transferable Skills	
		a1	a2	a3	b1	b2	d1	d2
1	The Origin and the Nature of Natural Products	x						
2	Plant-Derived Natural Products As a Source of Drug Discovery and Development		x	x	x	x		
3	Plant and Brain Cannabinoids: The Chemistry of phytocannabinoids	x	x	x	x	x		
4	Bioactive marine metabolite from red sea water	x	x	x	x	x		
5	Toxins of Marine Invertebrates and Microorganisms Activities	x	x	x	x	x	x	x
6	Chemistry of the irregular monoterpenes	x	x	x	x	x		
7	Chemistry of diterpenes .	x						
8	Natural Products for Pest Management		x	x	x	x		
9	Recent Advances in the Chemistry of Insect Pheromones and their applications.	x						
10	Recent Trends of Some Natural Sweet Substances from Plants .		x	x	x	x		
11	Natural Antioxidant ( NAO) of plants acting as scavengers of free radicals	x	x	x	x	x		
12	Potential Anticancer Natural Products from Plant-Associated Fungi	x	x	x	x	x		
13	Plant Fungal Endophytes: Interactions, Metabolites and Biosyntheses	x	x	x	x	x		
14	Nature Derived Antibiotics	x	x	x	x	x		
15	Activities	x	x	x	x	x	x	x

### Matrix II of Advanced Chemistry of natural products course

NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment			
					Lectures	Self learning	Written exam	Oral exam	Activity	
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology.	a1	<ul style="list-style-type: none"> <li>• The Origin and the Nature of Natural Products</li> <li>• Plant-Derived Natural Products As a Source of Drug Discovery and Development</li> <li>• Plant and Brain Cannabinoids:</li> <li>• The Chemistry of phytocannabinoids</li> <li>• Bioactive marine metabolite from red sea water</li> <li>• Toxins of Marine Invertebrates and Microorganisms</li> <li>• Chemistry of the irregular monoterpenes</li> <li>• Chemistry of diterpenes</li> <li>• Natural Products for Pest Management</li> </ul>	Scientific papers, text books and Internet	x	x	x	x	

				<ul style="list-style-type: none"> <li>• Recent Advances in the Chemistry of Insect Pheromones and their applications.</li> <li>• Recent Trends of Some Natural Sweet Substances from Plants</li> <li>• Natural Antioxidant (NAO) of plants acting as scavengers of free radicals</li> <li>• Potential Anticancer Natural Products from Plant-Associated Fungi</li> <li>• Plant Fungal Endophytes: Interactions, Metabolites and Biosyntheses</li> <li>• Nature Derived Antibiotics</li> </ul>						
2.1.2- Mutual influence between professional practice and its impact o the environment.	A.2- Understand how and why medicinal plants affect human and diverse strategies foe dealing with diseases.	a2	<ul style="list-style-type: none"> <li>• The Origin and the Nature of Natural Products</li> <li>• Plant-Derived Natural Products As a Source of Drug Discovery and Development</li> <li>• Plant and Brain Cannabinoids:</li> <li>• The Chemistry of</li> </ul>	Scientific papers, text books and Internet	x	x	x	x		

				<p>phytocannabinoids</p> <ul style="list-style-type: none"> <li>• Bioactive marine metabolite from red sea water</li> <li>• Toxins of Marine Invertebrates and Microorganisms</li> <li>• Chemistry of the irregular monoterpenes</li> <li>• Chemistry of diterpenes</li> <li>• Natural Products for Pest Management</li> <li>• Recent Advances in the Chemistry of Insect Pheromones and their applications.</li> <li>• Recent Trends of Some Natural Sweet Substances from Plants</li> <li>• Natural Antioxidant (NAO) of plants acting as scavengers of free radicals</li> <li>• Potential Anticancer Natural Products from Plant-Associated Fungi</li> <li>• Plant Fungal Endophytes: Interactions, Metabolites and</li> </ul>						
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				Biosyntheses Nature Derived Antibiotics						
2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	a3	<ul style="list-style-type: none"> <li>• The Origin and the Nature of Natural Products</li> <li>• Plant-Derived Natural Products As a Source of Drug Discovery and Development</li> <li>• Plant and Brain Cannabinoids:</li> <li>• The Chemistry of phytocannabinoids</li> <li>• Bioactive marine metabolite from red sea water</li> <li>• Toxins of Marine Invertebrates and Microorganisms</li> <li>• Chemistry of the irregular monoterpenes</li> <li>• Chemistry of diterpenes</li> <li>• Natural Products for Pest Management</li> </ul>	Scientific papers, text books and Internet	x	x	x	x		

				<ul style="list-style-type: none"> <li>• Recent Advances in the Chemistry of Insect Pheromones and their applications.</li> <li>• Recent Trends of Some Natural Sweet Substances from Plants</li> <li>• Natural Antioxidant (NAO) of plants acting as scavengers of free radicals</li> <li>• Potential Anticancer Natural Products from Plant-Associated Fungi</li> <li>• Plant Fungal Endophytes: Interactions, Metabolites and Biosyntheses</li> </ul> <p>Nature Derived Antibiotics</p>						
Intellectual Skills	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Synthesise information from disparate sources and use to inform complex problem solving.	b1	<ul style="list-style-type: none"> <li>• The Origin and the Nature of Natural Products</li> <li>• Plant-Derived Natural Products As a Source of Drug Discovery and Development</li> <li>• Plant and Brain Cannabinoids:</li> <li>• The Chemistry of phytocannabinoids</li> </ul>	Scientific papers, text books and Internet	x	x	x	x	

				<ul style="list-style-type: none"> <li>• Bioactive marine metabolite from red sea water</li> <li>• Toxins of Marine Invertebrates and Microorganisms</li> <li>• Chemistry of the irregular monoterpenes</li> <li>• Chemistry of diterpenes</li> <li>• Natural Products for Pest Management</li> <li>• Recent Advances in the Chemistry of Insect Pheromones and their applications.</li> <li>• Recent Trends of Some Natural Sweet Substances from Plants</li> <li>• Natural Antioxidant (NAO) of plants acting as scavengers of free radicals</li> <li>• Potential Anticancer Natural Products from Plant-Associated Fungi</li> <li>• Plant Fungal Endophytes: Interactions, Metabolites and Biosyntheses</li> </ul>						
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				Nature Derived Antibiotics						
			b2	<ul style="list-style-type: none"> <li>• The Origin and the Nature of Natural Products</li> <li>• Plant-Derived Natural Products As a Source of Drug Discovery and Development</li> <li>• Plant and Brain Cannabinoids:</li> <li>• The Chemistry of phytocannabinoids</li> <li>• Bioactive marine metabolite from red sea water</li> <li>• Toxins of Marine Invertebrates and Microorganisms</li> <li>• Chemistry of the irregular monoterpenes</li> <li>• Chemistry of diterpenes</li> <li>• Natural Products for Pest Management</li> <li>• Recent Advances in the</li> </ul>	Scientific papers, text books and Internet	x	x	x	x	

				<p>Chemistry of Insect Pheromones and their applications.</p> <ul style="list-style-type: none"> <li>• Recent Trends of Some Natural Sweet Substances from Plants</li> <li>• Natural Antioxidant (NAO) of plants acting as scavengers of free radicals</li> <li>• Potential Anticancer Natural Products from Plant-Associated Fungi</li> <li>• Plant Fungal Endophytes: Interactions, Metabolites and Biosyntheses Nature Derived Antibiotics</li> </ul>						
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General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Apply effective communication skills recognizing the need for a variety of approaches.	d1	activity			x					x
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work with and motivate others.	d6	activity			x					x

# Structure Determination of Natural Products

## Course specification of Structure Determination of Natural Products

### Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy Dept.
- Department offering the course: Pharmacognosy Dept.
- Date of specification approval: 2012/2013

### 1- Basic information:

Title: **Structure Determination of Natural Products**      Code:GSP2  
Lectures: 4 hrs/week      Credit hours: 4 hrs/week  
Total: 4hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to acquire the knowledge of different traditional and modern technique of UV, IR, and MS to possible lead to structure of Natural products.

### 3. Intended learning outcome s (ILOs) of Structure Determination of Natural Products:

<b>Knowledge and Understanding</b>	
<b>a1</b>	Outline the basic theories of different spectroscopic techniques.
<b>a2</b>	Describe the applications of different spectroscopic techniques in the structure elucidation of natural products.
<b>Intellectual skills</b>	
<b>b1</b>	Judge the quality of the recorded spectra.
<b>b2</b>	Correlate different spectroscopic data for the purpose of structure elucidation of natural products.
<b>General and Transferable Skills</b>	
<b>d1</b>	Use the library and other sources of information

### 4. Course Content of Structure Determination of Natural Products:

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
<b>1</b>	UV: theory, sample handling.
<b>2</b>	Characteristic absorption of chromophores .
<b>3</b>	Application of UV on different Natural Products
<b>4</b>	Infrared : theory, sample handling Activity
<b>5</b>	Characteristic group absorb. Applications on IR
<b>6</b>	MS: theory, sample handling, instrumentation. Parent ion characteristic

7	NMR: theory, sample handling, instrumentation.
8	<sup>1</sup> HNMR and <sup>13</sup> CNMR and other types of NMR.
9	Two dimensional NMR Application of some simple spectra.
10	Structure elucidation of different natural product classes: Flavonoids
11	Structure elucidation of different natural product classes: Alkaloids
12	Structure elucidation of different natural product classes: Terpenes Activity
13	Structure elucidation of different natural product classes: Coumarins
14	Structure elucidation of different natural product classes: Sugar and glycosides
15	Group discussion

### **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- noissucsid nepO

### **6- Student Assessment methods:**

Written exams to assess: a1, a2, b1and b2

Oral exam assess: a1, a2, b1and b2

Activity assess: d1

### Assessment schedule:

Assessment (1): Activity	Week 4-12
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

### Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## 7- References and books:

### A-Scientific papers

### B- Essential books:

- Comprehensive Natural Products Chemistry; Barton, D and Nakanishi, K, El sevier Science Ltd. (1999)
- Natural Products Chemistry; Torssel, K. B. G. :Apotekars.press (1997).
- Natural Products from Plants; Kaufmann, P. B et al; CRC Press (1999).

### Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

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- **Course Coordinators:** Prof Dr/ Abdel-monem Ateya
  - **Head of Department:** Prof Dr/ Sameeh El-Dahmi
  - **Date:** 2012-11 تم اعتماد التوصيف بمجلس القسم

<b>Matrix I of Structure Determination of Natural Products course</b>						
Week number	Course Contents	Knowledge and understanding		Intellectual skills		General and Transferable Skills
		a1	a2	b1	b2	d1
1	UV: theory, sample handling.	x				
2	Characteristic absorption of chromophores .	x				
3	Application of UV on different Natural Products		x	x		
4	Infrared : theory, sample handling Activity	x				x
5	Characteristic group absorb. Applications on IR	x	x	x		
6	MS: theory, sample handling, instrumentation. Parent ion characteristic	x				
7	NMR: theory, sample handling, instrumentation.					
8	<sup>1</sup> HNMR and <sup>13</sup> CNMR and other types of NMR.	x				
9	Two dimensional NMR Application of some simple spectra.	x	x	x		
10	Structure elucidation of different natural product classes: Flavonoids		x	x	x	
11	Structure elucidation of different natural product classes: Alkaloids		x	x	x	
12	Structure elucidation of different natural product classes: Terpenes Activity		x	x	x	x
13	Structure elucidation of different natural product classes: Coumarins		x	x	x	
14	Structure elucidation of different natural product classes: Sugar and glycosides		x	x	x	
15	Group discussion	x	x	x	x	

Matrix II of Structure Determination of Natural Products										
NARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology.	a1	UV: theory, sample handling. Characteristic absorption of chromophores Infrared : theory, sample handling Characteristic group absorb. MS: theory, sample handling, instrumentation. Parent ion characteristic NMR: theory, sample handling, instrumentation. 1HNMR and 13CNMR and other types of NMR. Two dimensional	Scientific papers, text books and Internet	x	x	x	x	

				NMR						
	2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	a2	Application of UV on different Natural Products Applications on IR Application of some simple spectra. Structure elucidation of different natural product classes: Flavonoids Structure elucidation of different natural product classes: Alkaloids Structure elucidation of different natural product classes:	Scientific papers, text books and Internet	x	x	x	x	

				Terpenes Structure elucidation of different natural product classes: Coumarins Structure elucidation of different natural product classes: Sugar and glycosides						
Intellectual Skills	2.2.1-Analyze and evaluate information in the field of specialization and analogies to solve problems.	B.1- Appraise critically the quality of data and information offered from different sources to solve problems	b1	Application of UV on different Natural Products Applications on IR Application of some simple spectra. Structure elucidation of different natural product classes: Flavonoids Structure elucidation of different natural product classes: Alkaloids Structure elucidation of different natural product classes:	Scientific papers, text books and Internet	x	x	x	x	

				Terpenes Structure elucidation of different natural product classes: Coumarins Structure elucidation of different natural product classes: Sugar and glycosides						
	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Synthesise information from disparate sources and use to inform complex problem solving.	b2	Structure elucidation of different natural product classes: Flavonoids Structure elucidation of different natural product classes: Alkaloids Structure elucidation of different natural product classes: Terpenes Structure elucidation of different natural product classes: Coumarins Structure elucidation	Scientific papers, text books and Internet	x	x	x	x	

				of different natural product classes: Sugar and glycosides						
<b>General and Transferable Skills</b>	2.4.4- Use variable sources to get information and knowledge.	D.4- Make effective use of library and other sources of information in the field of pharmacognosy	d1	Activity	Scientific papers, text books and Internet		x			x

# Methods in Natural products research

## Course specification of methods in natural products research

### Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmacognosy Dept.
- Department offering the course: Pharmacognosy Dept.
- Date of specification approval: 2012/2013

### 1- Basic information:

Title: Methods in natural products research                      Code: GSP3  
Lectures: 4 hrs/week                                                      Credit hours: 4 hrs  
Total: 4hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will acquire the proper knowledge and awareness of different searching sources of information, websites, different flora of medicinal plants, herbarium setting, extraction methods, chromatography and preparation of sample for structure elucidation

### 3. Intended learning outcome s (ILOs) of Structure Determination of Natural Products:

<b>Knowledge and Understanding</b>	
<b>a1</b>	Recognize the different types of information resources that have benefit in the natural products field
<b>a2</b>	Describe different plat herbarium and documentation
<b>a3</b>	Summarize different methods for extraction of plant materials
<b>a4</b>	classify different chromatographic techniques
<b>Intellectual skills</b>	
<b>b1</b>	Select the proper method for purification of natural products
<b>b2</b>	Apply the knowledge of different resources of natural products information in research
<b>General and Transferable Skills</b>	
<b>d1</b>	Develop communication skills
<b>d2</b>	Use the library and other sources of information

### 4. Course Content of Structure Determination of Natural Products:

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
<b>1</b>	Information sources: Chemical abstract, text book
<b>2</b>	Information sources: internet resources
<b>3</b>	Information sources: flora books
<b>4</b>	Herbarium setting and structure
<b>5</b>	Authorization of identified plants: plant authors and binomial system Activity

6	Preparation of a plant sample for herbarium
7	Extraction: methods and solvents
8	Isolation: blind phytochemical versus biological guiding
9	Isolation: fractionation and purification Activity
10	Chromatography: classical methods
11	Chromatography: new techniques for analysis and isolation
12	Crystallization: methodology
13	Derivatization: reasons and different types
14	Derivatization: reactions and different mechanisms
15	Applications: Case studies

### 5- Teaching and Learning Methods:

- Lectures
- Self learning
- noissucsid nepO

### 6- Student Assessment methods:

Written exams to assess: a1, a2, a3, a4, b1 and b2

Oral exam assess: a1, a2, a3, a4, b1 and b2

Activity assess: d1, d2

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 5,9
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

### 7- References and books:

#### A-Scientific papers

#### B- Essential books:

- Comprehensive Natural Products Chemistry; Barton, D and Nakanishi, K, El sevier Science Ltd. (1999)
- Natural Products Chemistry; Torssel, K. B. G. :Apotekars.press (1997).
- Natural Products from Plants; Kaufmann, P. B et al; CRC Press (1999).

#### Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.
- 

- **Course Coordinators:** Prof Dr/ Abdel-monem Ateya
- **Head of Department:** Prof Dr/ Sameeh El-Dahmi
- **Date:** 2012-11 تم اعتماد التوصيف بمجلس القسم

**Matrix I of Methods in natural products research**

Week number	Course Contents	Knowledge and understanding				Intellectual skills		General and Transferable Skills	
		a1	a2	a3	a4	b1	b2	d1	d2
1	Information sources: Chemical abstract, text book	x				x			
2	Information sources: internet resources	x				x			
3	Information sources: flora books	x				x			
4	Herbarium setting and structure	x				x			
5	Authorization of identified plants: plant authors and binomial system Activity		x			x		x	x
6	Preparation of a plant sample for herbarium		x			x			
7	Extraction: methods and solvents			x			x		
8	Isolation: blind phytochemical versus biological guiding			x			x		
9	Isolation: fractionation and purification Activity			x			x	x	x
10	Chromatography: classical methods				x		x		
11	Chromatography: new techniques for analysis and isolation				x		x		
12	Crystallization: methodology			x			x		
13	Derivatization: reasons and different types			x			x		
14	Derivatization: reactions and different mechanisms			x			x		
15	Applications: Case studies	x	x	x	x		x		

Matrix II of Methods in natural products research

Matrix II of Methods in natural products research										
NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment			
					Lectures	Self learning	Written exam	Oral exam	Activity	
Knowledge and Understanding	2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	a1	Information sources: Chemical abstract, text book Information sources: internet resources Information sources: flora books Herbarium setting and structure	Scientific papers, text books and Internet	x	x	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy	a2	Authorization of identified plants: plant authors and binomial system Activity Preparation of a plant sample for herbarium	Scientific papers, text books and Internet	x	x	x	x	

	and plant biotechnology.	a3	Extraction: methods and solvents Isolation: blind versus phytochemical biological guiding Isolation: fractionation and purification Activity	Scientific papers, text books and Internet	x	x	x	x	
2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	a4	Chromatography: classical methods Chromatography: new techniques for analysis and isolation	Scientific papers, text books and Internet	x	x	x	x	

Intellectual Skills	2.2.1-Analyze and evaluate information in the field of specialization and analogies to solve problems.	B.1- Appraise critically the quality of data and information offered from different sources to solve problems	b1	Information sources: Chemical abstract, text book Information sources: internet resources Information sources: flora books Herbarium setting and structure Authorization of identified plants: plant authors and binomial system Activity Preparation of a plant sample for herbarium	Scientific papers, text books and Internet	x	x	x	x	
	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Synthesise information from disparate sources and use to inform complex problem solving.	b2	Extraction: methods and solvents Isolation: blind versus phytochemical biological guiding Isolation: fractionation and purification Activity Chromatography: classical methods Chromatography: new techniques for analysis and isolation	Scientific papers, text books and Internet	x	x	x	x	

General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Apply effective communication skills recognizing the need for a variety of approaches.	d1	Activity	Scientific papers, text books and Internet		x			x
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work with and motivate others.	d2	Activity	Scientific papers, text books and Internet		x			x

# Master Thesis Specification

## Thesis of Master Degree

### A- Thesis specifications:

- **Program on which the course is given:** Master of Pharmaceutical sciences (Pharmacognosy)
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmacognosy
- **Department offering the thesis:** Pharmacognosy
- **Date of specification approval:** 2012/2013

### **1- Basic information:**

Title: Master Thesis in Pharmacognosy

Credit hours: 30 hrs

### **2- Overall aim of the thesis:**

**On completion of the thesis, the students will be able to:**

- Design a robust study to answer the research question
- Identify and perform different techniques and methods used in the experimental work according to the designed protocol
- Collect all the data needed to answer the research question using the developed study design
- Analyze the results of the study in the light of prior knowledge
- Draw conclusions about the contribution to knowledge made by the study.

### **3- Intended learning outcome's (ILOs):**

<b>Knowledge and Understanding</b>	
<b>a1</b>	Have a strong background to start work in the thesis.

<b>a2</b>	Select the point of the thesis according to the problems present in the community.
<b>a3</b>	Identify advanced techniques and developments that can be used during study.
<b>a4</b>	Abide to values, moral, legal and religious issues of professional practice and research.
<b>a5</b>	Demonstrate quality during practical work.
<b>a6</b>	Identify and apply scientific experimental ethics.
<b>Intellectual skills</b>	
<b>b1</b>	Analyze and interpret the experimental data in a suitable form to solve the suggested problem.
<b>b2</b>	Apply different techniques to solve problems.
<b>b3</b>	Integrate all required knowledge to solve problems that may rise during practical work.
<b>b4</b>	Conduct a research project and write scientific reports.
<b>b5</b>	Reduce and eliminate risks during professional practice.
<b>b6</b>	Plan to improve performance before and during practical work.
<b>b7</b>	Make decisions related to recent and future studies.
<b>Professional and practical skills</b>	
<b>c1</b>	Perform practical experiments related to the point understudy.
<b>c2</b>	Review and summarize information in professional reports.
<b>c3</b>	Conduct various methods and techniques of analysis related to pharmacognosy.
<b>General and Transferable skills</b>	
<b>d1</b>	Communicate effectively with professionals.
<b>d2</b>	Use information technology in review and thesis preparation.

<b>d3</b>	Evaluate the work and learning needs.
<b>d4</b>	Use various sources to get information about the subject understudy.
<b>d5</b>	Set rules for evaluation and judging others performance.
<b>d6</b>	Work effectively as a member of a team.
<b>d7</b>	Prioritize work and meet deadlines.
<b>d8</b>	Study independently and plan research studies.

#### **4. Thesis Content:**

<b>Steps</b>	<b>Content</b>
1 <sup>st</sup>	<ul style="list-style-type: none"><li>• Suggest the possible points/ problems of research that the candidate can work on in the frame of the aim of work and choose proper point related to the problems of the community and surrounding environment.</li><li>• Collect all available information about this subject by all possible means.</li><li>• Use internet, journals, books and other trusted sources of information to get previous and recent data and information about the subject understudy.</li><li>• Design protocol including the steps of work following a proper schedule.</li><li>• Increase the awareness of the recent techniques that can be used during practical work and determined by the protocol.</li><li>• Integrate different knowledge required to solve suggested problem.</li></ul>

	<ul style="list-style-type: none"><li>• Continuous evaluation to the thesis outcome according to the schedule.</li></ul>
2 <sup>nd</sup>	<ul style="list-style-type: none"><li>• Apply different practical techniques for separation and purification of different classes of natural products.</li><li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li><li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li><li>• Modify methods for production of active constituents using plant tissue culture.</li><li>• Evaluate and manage hazards throughout the whole practical work.</li><li>• Organize the experimental work according to the designed protocol.</li><li>• Apply ethical recommendations in all aspects of scientific research e.g. citation, publication.....</li></ul>
3 <sup>rd</sup>	<ul style="list-style-type: none"><li>• Select some of the compounds for their pharmacological or microbiological activities.</li><li>• Interpret the biological results.</li><li>• Perform statistical analysis and biological correlation for the results.</li><li>• Present and describe the results graphically.</li><li>• Understand any legal aspects related to the thesis work.</li></ul>

4 <sup>th</sup>	<ul style="list-style-type: none"><li>• Communicate with supervisors to discuss results.</li><li>• Work effectively as a member of a team (e.g. Supervisors and various professionals).</li><li>• Present the results periodically in seminars.</li><li>• Write scientific reports on the obtained results with conclusive significance.</li><li>• Discuss obtained results in comparison with pervious literatures.</li><li>• Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li><li>• Present the thesis in a written form.</li><li>• Summarize the thesis in an understandable Arabic language for non professionals.</li><li>• Write references in the required form (Thesis, Paper.....).</li><li>• Demonstrate the thesis in a final power point presentation.</li><li>• Continue self-learning throughout the experimental work and writing scientific papers.</li></ul>
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### **5- Teaching and Learning Methods:**

- Self learning (Activities, Research....)
- Open discussion

### **6- References:**

- **Websites:** Pubmed, Sciencedirect, Weilyinterscience

**Facilities required for:**

1. **For practical work:** Rotary evaporator, UV lamp, UV spectrophotometer, IR spectrophotometer, NMR spectrophotometer, Mass spectrophotometer, PHmeter, Hot plate stirrer, condensation unit, oil isolation unit, incubators, microscopes

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**Head of Department: Prof. Dr. Sameeh Eldahmi**

Master Thesis (Pharmacognosy)				
NARS		Program ILOs	Thesis ILOs	Thesis content
<b>Knowledge and Understanding</b>	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Achieve advanced knowledge in pharmacognosy and a strong background in major academic areas of natural products chemistry and plant biotechnology.	Have a strong background to start work in the thesis.	<ul style="list-style-type: none"> <li>• Collect all available information about this subject by all possible means.</li> </ul>
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2- Understand how and why medicinal plants affect human and diverse strategies for dealing with diseases.	Select the point of the thesis according to the problems present in the community.	<ul style="list-style-type: none"> <li>• Suggest the possible points/problems of research that the candidate can work on in the frame of the aim of work and choose proper point related to the problems of the community and surrounding environment.</li> </ul>
	2.1.3- Scientific developments in the area of specialization.	A.3- Identify advanced concerns, methods and findings in the field of natural products chemistry, pharmacognosy and plant biotechnology.	Identify advanced techniques and developments that can be used during study.	<ul style="list-style-type: none"> <li>• Increase the awareness of the recent techniques that will be used during practical work and determined by the protocol.</li> </ul>
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.4- Abide to values, moral, legal and religious issues of professional practice and research.	Abide to values, moral, legal and religious issues of professional practice and research.	<ul style="list-style-type: none"> <li>• Understand any legal aspects related to the thesis work.</li> </ul>

	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5- Determine the basics related to quality assurance in the field of pharmacognosy and related subjects.	Demonstrate quality during practical work.	<ul style="list-style-type: none"> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>
	2.1.6- The fundamentals and ethics of scientific research.	A.6- Understand how to work according to ethical frameworks.	Identify and apply scientific experimental ethics.	<ul style="list-style-type: none"> <li>• Apply ethical recommendations in all aspects of scientific research e.g citation, publication.....</li> </ul>

<b>Intellectual Skills</b>	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Appraise critically the quality of data and information offered from different sources to solve problems.	Analyze and interpret the experimental data in a suitable form to solve the suggested problem.	<ul style="list-style-type: none"> <li>• Select some compounds for their pharmacological or microbiological activities.</li> <li>• Interpret the biological results.</li> <li>• Perform statistical analysis and biological correlation for the results.</li> <li>• Present and describe the results graphically.</li> </ul>
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Identify gaps or weaknesses in existing knowledge and identify appropriate means of resolving them.	Apply different techniques to solve problems.	<ul style="list-style-type: none"> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>

	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Synthesise information from disparate sources and use to inform complex problem solving.	Integrate all required knowledge to solve problems that may rise during practical work.	<ul style="list-style-type: none"> <li>• Integrate different knowledge required to solve suggested problem.</li> </ul>
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research either individually or as a part of team through research design, data collection, analysis, synthesis and reporting.	Conduct a research project and write scientific reports.	<ul style="list-style-type: none"> <li>• Write scientific reports on the obtained results with conclusive significance.</li> </ul>
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Reduce and eliminate risks during professional practice.	Reduce and eliminate risks during professional practice.	Evaluate and manage hazards throughout the whole practical work.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Reflect critically on own performance and that of others and then take appropriate action to improve subsequent actions.	Plan to improve performance before and during practical work.	<ul style="list-style-type: none"> <li>• Design the protocol including the steps of work following a proper schedule.</li> <li>•Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li> <li>• Modify methods for production of active constituents using plant tissue culture.</li> </ul>

	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions and respond to experience and circumstances.	Make decisions related to recent and future studies.	<ul style="list-style-type: none"><li>• Suggest the possible points/problems of research that the candidate can work on in the frame of the aim of work and choose proper point related to the problems of the community and surrounding environment.</li><li>• Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li></ul>
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<b>Professional and Practical Skills</b>	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1-Master a wide range of practical and laboratory skills in the field of pharmacognosy.	Perform practical experiments related to the point understudy.	<ul style="list-style-type: none"> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> <li>• Modify methods for production of active constituents using plant tissue culture.</li> </ul>
	2.3.2- Write and evaluate professional reports.	C.2- Review and summarize information in professional reports.	Review and summarize information in professional reports.	<ul style="list-style-type: none"> <li>• Present the thesis in a written form</li> <li>• Summarize the thesis in an understandable Arabic language for non professionals.</li> <li>• Write references in the required form (Thesis, Paper.....).</li> </ul>

	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Conduct various methods and techniques of analysis related to pharmacognosy.	Conduct various methods and techniques of analysis related to pharmacognosy.	<ul style="list-style-type: none"> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>
<b>General and Transferable Skills</b>	2.4.1- Communicate effectively.	D.1- Apply effective communication skills recognizing the need for a variety of approaches.	Communicate effectively with professionals.	<ul style="list-style-type: none"> <li>• Communicate with supervisors to discuss results.</li> </ul>
	2.4.2- Effectively use information technology in professional practices	D.2- Make effective use of information technology e.g. word processing, spread sheets, presentation software, internet....etc.	Use information technology in review and thesis preparation.	<ul style="list-style-type: none"> <li>• Present the results periodically in seminars</li> <li>• Demonstrate the thesis in a final power point presentation.</li> </ul>

2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment and define learning needs in the field of pharmacognosy.	Evaluate the work and learning needs.	• Continuous evaluation to the thesis outcome according to the schedule.
2.4.4- Use variable sources to get information and knowledge.	D.4- Make effective use of library and other sources of information in the field of pharmacognosy	Use various sources to get information about the subject understudy.	• Use internet, journals, books and others thesis to get previous and recent information about the subject understudy.
2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Establish rules for judging others performance related to the pharmacognosy.	Set rules for evaluation and judging others performance.	• Discuss obtained results in comparison with pervious literatures.
2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work with and motivate others.	Work effectively as a member of a team.	• Work effectively as a member of a team (e.g. Supervisors and various professionals).
2.4.7- Manage time effectively.	D.7- Prioritize work and meet deadlines.	Prioritize work and meet deadlines.	• Organize the experimental work according to the designed protocol.
2.4.8- Continuous and self learning.	D.8- Develop the skills required for continuing professional development.	Study independently and plan research studies.	• Continue self-learning throughout the experimental work and writing scientific papers.

# PhD Degree Specification

## Program Specification

### A- Basic Information

**1- Program title:** PhD. Pharm. Sci Degree in **Pharmacognosy**

**2- Program type:** Monodisciplinary.

**3- Faculty/ University:** Faculty of Pharmacy, Zagazig University

**4- Department:** Pharmacognosy

**5- Coordinator:** Prof. Dr. Assem ElShazly

**6- Date of program specification approval:** 2012

## **B- Professional Information**

### **1- Program aims:**

The Pharmacognosy PhD program aims to provide the doctorate students with a special and advanced education in the field of Pharmacognosy and enable the doctorate students to gain the skills and attitudes required for the responsible practice of Pharmacy.

### **2-Intended Learning Outcomes (ILOs):**

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for **Pharmacognosy PhD** of sciences degree.

#### **2-1- Knowledge and Understanding :**

**On successful completion of the PhD degree Program, students will be able to:**

A1- Illustrate in-depth knowledge and basic theories of botany, natural products chemistry, biosynthesis, biochemistry, enzymology and cell culture.

A2- Illustrate sufficient knowledge on sophisticated methods of isolation, and chromatographic purification as well as structure elucidation of natural products using physicochemical and advanced spectral methods.

A3- Illustrate essential knowledge and applications of plant tissue culture, biotransformation and genetic engineering of plants.

A4- Illustrate the Fundamentals, methods, techniques, tools and ethics of scientific research.

A5- State the ethical and legal principles in pharmacy and academic practices.

A6- Illustrate the principles and bases of quality assurance in professional practice in the field of isolation and elucidation of natural products and in biotransformation and genetic engineering techniques.

A7- Verify the relevant knowledge concerning the impact of professional practice of the field of natural product research on society and environment.

### **2-2 - Intellectual Skills:**

**On successful completion of the PhD degree Program, students will be able to:**

B1- Suggest new structures and proper identification of natural products by spectroscopic means and genius interpretation of the physicochemical and spectroscopic data of natural products.

B2- Expect new natural products with few available spectral data.

B3- Predict byproducts, mechanism of biosynthetic ways and how to enhance the formation of bioactive metabolites in tissue cultures and biotransformation techniques.

B4- Develop and modify the methods arise from instrumental techniques in the field of biotechnology.

B5- Conduct research studies that add to the current knowledge.

B6- Formulate scientific papers.

B7- Assess hazards and risks in Pharmacognosy field.

B8- Plan to improve performance in the Pharmacognosy field.

B9- Take professional decisions and bears responsibility.

B10- Be creative and innovative.

B11- Manage discussions and arguments based on evidence and logic.

### **2-3 - Professional and Practical Skills:**

**It is intended that, on successful completion of the PhD degree Program, students will be able to:**

C1- Identify and make taxonomical citation of crude drugs.

C2- Extract, isolate, purify and identify natural constituents using physical, chemical and chromatographic techniques.

C3- Select proper media and adjust the conditions for tissue culture.

C4- Design and efficiently perform genetic engineering and biotechnology experiments for plant products in analytical and preparative scales.

C5- Write and critically evaluate professional reports in the field of natural product and other related fields.

C6- Construct a critical review of existing literature or other scholarly output.

C7- Evaluate and develop methods and tools existing in the field of natural product.

C8- Properly use technological means in a better professional practice.

C.9- Plan to improve professional practices and to improve the performance of other scholars.

### **2-4 - General and Transferable Skills:**

**On successful completion of the PhD degree Program, students will be able to:**

D1- Communicate effectively, with colleagues and a wider audience, in a variety of media.

D2- Use the information technologies (IT) in improving the professional practices efficiently.

D3- Help others to learn and evaluate their performance.

D4- Continue to learn independently and to develop professionally.

D5- Use various sources to get information and knowledge.

D6- Implement tasks as a member and lead a team of workers.

D7- Direct scientific meetings and manage time effectively.

### **3- Academic Standards:**

- NARS (National Academic Reference Standards)

**Matrix:** Comparison between PhD degree program ILOs and the National Academic Reference Standards

NARS vs. Program ILOs ( PhD in Pharmacognosy)		
NARS		Program ILOs
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1-Illustrate in-depth knowledge and basic theories of botany, natural products chemistry, biosynthesis, biochemistry, enzymology and cell culture.
		A.2- Illustrate sufficient knowledge on sophisticated methods of isolation, and chromatographic purification as well as structure elucidation of natural products using physicochemical and advanced spectral methods.

		A.3-Illustrate essential knowledge and applications of plant tissue culture, biotransformation and genetic engineering of plants .
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.4- Illustrate the Fundamentals, methods, techniques, tools and ethics of scientific research.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.5- State the ethical and legal principles in pharmacy and academic practices.
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.6- Illustrate the principles and bases of quality assurance in professional practice in the field of isolation and elucidation of natural products and in biotransformation and genetic engineering techniques.
	2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A.7-Verify the relevant knowledge concerning the impact of professional practice of the field of natural product research on society and environment.
Intellectual Skills	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction).	B.1-Suggest new structures and proper identification of natural products by spectroscopic means and genius interpretation of the physicochemical and spectroscopic data of natural products.

	B.2-Expect a new natural products with few available spectral data.
	B.3-Predict bioproducts, mechanism of biosynthetic ways and how to enhance the formation of bioactive metabolites in tissue cultures and biotransformation techniques.
2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.4- Advance , develop and modify the methods arise from instrumental techniques in the field of biotechnology.
2.2.3- Conduct research studies that add to the current knowledge.	B.5- Conduct research studies that add to the current knowledge.
2.2.4- Formulate scientific papers.	B.6-Formulate scientific papers.
2.2.5- Asses hazards and risks in professional practice in his \ her areas of specialization.	B.7- Assess hazards and risks in Pharmacognosy field.
2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.8- Plan to improve performance in the Pharmacognosy field.
2.2.7- Take Professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.9- Take professional decisions and bears responsibility.
2.2.8- Be creative and innovative.	B.10- Be creative and innovative.
2.2.9- Manage discussions and arguments based on evidence and logic.	B.11- Manage discussions and arguments based on evidence and logic.

Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Identify and make taxonomical citation of crude drugs.
		C.2- Extract, isolate, purify and identify natural constituents using physical, chemical and chromatographic techniques.
		C.3- Select proper media and adjust the conditions for tissue culture.
		C.4- Design and efficiently perform genetic engineering and biotechnology experiments for plant products in analytical and preparative scales.
	2.3.2- Write and critically evaluate professional reports.	C.5- Write and critically evaluate professional reports in the field of natural product and other related fields.
		C.6- Construct a critical review of existing literature or other scholarly output.
	2.3.3- Evaluate and develop methods and tools existing in the area of specialization.	C.7- Evaluate and develop methods and tools existing in the field of natural product.
	2.3.4- Properly use technological means in a better professional practice.	C.8- Properly use technological means in a better professional practice.
	2.3.5- Plan to improve professional practice and to improve the performance of other scholars.	C.9- Plan to improve professional practices and to improve the performance of other scholars.

General and Transferable Skills	2.4.1- Effective Communication in its different forms.	D.1-Communicate effectively, with colleagues and a wider audience, in a variety of media.
	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Use the information technologies (IT) in improving the professional practices efficiently.
	2.4.3- Help others to learn and evaluate their performance.	D.3- Help others to learn and evaluate their performance
	2.4.4- Self-assessment and continuous learning.	D.4- Continue to learn independently and to develop professionally.
	2.4.5- Use various sources to get information and knowledge.	D.5- Use various sources to get information and knowledge.
	2.4.6- Work as a member and lead a team of workers.	D.6- Implement tasks as a member and lead a team of workers.
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Direct scientific meetings and manage time effectively.

#### 4-Curriculum Structure and Contents:

**a- Program duration:** 3- 5 years

**b- Program structure:**

- The PhD program can be completed in 3-5 years.
- The Faculty of pharmacy implements the credit hour system.
- The program is structured as:

**1- Courses:**

**No. of credit hours for program courses:**

Special: (3x4) 12

**2- Thesis:** 30 hours

The candidate must complete a research project on an approved topic in the Pharmaceutical Sciences. To fulfill this requirement the student must present (written and orally) a research proposal and write a thesis.

**3- General University Requirements:** 10 credit hours including:

a- TOEFL (500 units)

b- Computer course

**c-Program Curriculum:**

Course Code	Course Title	Credit hours	Program ILOs Covered
	Special Courses:		
Gsp4	Advanced Spectroscopy	4	A2, B1, B4, D1 and D2
Gsp5	Biosynthesis of natural products	4	A1, B3 and D4
Gsp6	Advanced Natural Products Biotechnology	4	A3, B3, D1 and D6

	Thesis	30	A1, A2, A3, A4, A5, A6, A7, B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, C1, C2, C3,C4, C5, C6, C7, C8, C9, D1, D2, D3, D4, D5, D6 and D7
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### 5-Program admission requirements:

- Candidate should have obtained the certificate of Master degree in pharmaceutical sciences in the same specialty from one of the Egyptian universities or an equivalent certificate from a foreign institute recognized by the university.

### 6- Admission Policy:

The faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (ESCU).

### 7-Student assessment methods:

Method	ILOS
Written exam	Knowledge and Understanding and Intellectual Skills
Oral exam	Knowledge and Understanding ,Intellectual Skills and General and Transferable Skills
Activity	Intellectual Skills and General and Transferable

	Skills
Seminars	Knowledge and Understanding ,Intellectual Skills & General and Transferable Skills
Follow up	Professional and practical Skills & General and Transferable Skills
Thesis and oral presentation	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

Grade Scale	Grade point average value (GPA)	Numerical scale
A+	5	≥ 95%
A	4.5	90- < 95%
B+	4	85- < 90%
B	3.5	80- < 85%
C+	3	75- < 80%
C	2.5	70- < 75%
D+	2	65- < 70%
D	1.5	60- < 65%

### 8-Failure in Courses:

Students who fail to get 60% ( 1 point)

### 9-Methods of program evaluation

Evaluator	Method	Sample
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<b>Internal evaluator:</b> Professor Dr. Sameeh El-Dahmy	Program evaluation Courses evaluation	Program report Courses report
<b>External evaluator:</b> Professor Dr. Said AboTabl	Program evaluation Courses evaluation	Program report Courses report
<b>Others methods</b>	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

**Program coordinator**  
**Prof. Dr. Assem El-Shazly**

**Head of Department**  
**Prof. Dr. Sameh el-Dahmy**

# Advanced Spectroscopy

## Course specification of Advanced Spectroscopy

### A- Course specifications:

Program on which the course is given: PhD of Pharmaceutical Sciences

Major or Minor element of program: Major

Department offering the program: Pharmacognosy Dept.

Department offering the course: Pharmacognosy Dept.

Date of specification approval: 2012/2013

### 1- Basic information:

Title: Advanced Spectroscopy

Code: Gsp4

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to acquire recent and advanced education in the field of the identification of the isolated compounds by using all the spectroscopic methods and gain the ability of creativity required for innovative and responsible practice of research in the new area of the field.

### 3. Intended learning outcome s (ILOs) of Advanced Spectroscopy:

Knowledge and Understanding	
a1	Outline the uses of H1 and C13 NMR in the identification and structural elucidation of the natural compounds.
a2	Illustrate the instrumentation and sample handling.
a3	State the coupling of proton to other nuclei, chemical shift

	equivalence and magnetic equivalence.
a4	Point out various the long range coupling, spin decoupling and the shift reagents.
a5	Outline the uses of mass spectrum , determination of molecular formula and recognition of the molecular ion peak.
a6	Illustrate the fragmentation of the different compounds.
Intellectual skills	
b1	Propose H1 and C13 NMR in the identification and structural elucidation of the natural compounds
b2	Recognize the mass spectrum and their application
b3	Suggest new structures and proper identification of natural products by spectroscopic means.
b4	Elucidate new natural products with few available spectral data
General and transferable skills	
d1	Perform presentations with confidence
d2	Utilize database, word processing, statistical analysis and other IT facilities

#### 4. Course Content of Advanced Spectroscopy:

Week number	Lecture contents (4hrs/week)
1	Introduction of H <sup>1</sup> and C <sup>13</sup> NMR
2	Instrumentation and sampling
3	Chemical shift
4	Simple spin coupling

5	Proton in hetero atom, coupling of proton on hetero atoms Activity
6	AMX, ABX and ABC systems with three coupling constant.
7	Effect of chiral centre ,vicinal and germinal coupling in rigid system and spin decoupling
8	Introduction and instrumentation of mass spectrometry
9	Determination of molecular formula and their uses Activity
10	Recognition of the molecular ion peak
11	Fragmentation of aliphatic and monocyclic compounds.
12	Fragmentation of alcohols, amides and amines
13	Fragmentation cyclic amines
14	Aromatic hydrocarbons
15	Mass spectra of some important chemical classes

### 5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open Discussion

### 6- Student Assessment methods:

Written exams to assess: a1- a6 and b1- b4

Oral exam assess: a1- a6 and b1- b4

Activity assess: d1 and d2

### Assessment schedule:

Assessment (1): Activity	Week 5-9
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

### Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## 7- References and books:

### A-Scientific papers

### B- Essential and suggested books:

- Spectroscopic identification of organic compounds; Silverstein, R.; Webster, F. and Kiemle, D., Wiley and sons (2005).
- Spectroscopic methods in organic chemistry; Williams, D.H. and Fleming I. (6th edition), McGraw-Hill Higher Education(2007).
- Structural Elucidation of Natural Products; MS; Djerassi, C. and Budzikiewicz, H. and Williams, D.H.; Holden-Day USA(1964).
- Application of Absorption Spectroscopy of Organic Compounds; Dyer, J.R.; Prentice-Hall(1965).
- One-dimensional and Two-dimensional NMR Spectra by Modern Pulse Techniques; Koji Nakanishi, University science books, California, USA(1990).

### C- Periodicals:

- Phytochemistry
- Journal of Natural Products
- Plants medica
- Ethnopharmacology

**Facilities required for teaching and learning:**

For lectures: Black (white) boards, computer, data show.

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**Course Coordinators: Prof Dr/ Sameeh El-Dahmi**

**Head of Department: Prof Dr/ Sameeh El-Dahmi**

Date: 2012-11 تم اعتماد التوصيف بمجلس القسم

Matrix I of Advanced Spectroscopy course													
Week number	Course Contents	Knowledge and understanding						Intellectual skills				General and Transferable Skills	
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	d1	d2
1	Introduction of H <sup>1</sup> and C <sup>13</sup> NMR	x								x	x		
2	Instrumentation and sampling		x							x	x		
3	Chemical shift			x				x		x	x		
4	Simple spin coupling				x			x		x	x		
5	Proton in hetero atom, coupling of proton on hetero atoms activity				x			x		x	x	x	x
6	AMX, ABX and ABC systems with three coupling constant.				x			x		x	x		
7	Effect of chiral centre ,vicinal and germinal coupling in rigid system and spin decoupling				x			x		x	x		
8	Introduction and instrumentation of mass spectrometry					x			X	x	x		
9	Determination of molecular formula					x			x	x	x	x	x

	and their uses Activity												
10	Recognition of the molecular ion peak					x			x	x	x		
11	Fragmentation of aliphatic and monocyclic compounds.						x		x	x	x		
12	Fragmentation of alcohols, amides and amines						x		x	x	x		
13	Fragmentation cyclic amines						x		x	x	x		
14	Aromatic hydrocarbons						x		x	x	x		
15	Mass spectra of some important chemical classes						x		x	x	x		

Matrix II of Advanced Spectroscopy										
NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment			
					Lectures	Self learning	Written exam	Oral exam	Activity	
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.2- Illustrate sufficient knowledge on sophisticated methods of isolation, and chromatographic purification as well as structure elucidation of natural products using physicochemical and advanced spectral methods.	a1	Introduction of H1 and C13 NMR	Scientific papers, text books and Internet	x	x	x	x	
			a2	Instrumentation and sampling						
			a3	Chemical shift	Scientific papers, text books and Internet	x	x	x	x	
			a4	Simple spin coupling						
				Proton in hetero atom, coupling of proton on hetero atoms	Scientific papers, text books and Internet	x	x	x	x	
				AMX, ABX and ABC systems with three coupling constant.						
				Effect of chiral centre ,vicinal and germinal coupling in rigid system and spin decoupling	Scientific papers, text books and Internet	x	x	x	x	
a5	Introduction and instrumentation of mass spectrometry									

				Determination of molecular formula and their uses	Scientific papers, text books and Internet	x	x	x	x	
				Recognition of the molecular ion peak						
			a6	Fragmentation of aliphatic and monocyclic compounds.	Scientific papers, text books and Internet	x	x	x	x	
				Fragmentation of alcohols, amides and amines						
				Fragmentation cyclic amines	Scientific papers, text books and Internet	x	x	x	x	
Aromatic hydrocarbons										
				Mass spectra of some important chemical classes	Scientific papers, text books and Internet	x	x	x	x	
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization	B.1- Appraise critically the quality of data and information offered from	b1	Modern trends in plant taxonomy: External morphology, vegetative anatomy	Scientific papers, text books and Internet	x	x	x	x	
			b2	Floral anatomy, cytology and	Scientific	x	x	x	x	

	and analogies to solve problems	different sources to solve problems.		palynology.	papers, text books and Internet						
				Numerical taxonomy (principles, advantages, applications)	Scientific papers, text books and Internet	x	x	x		x	
				Chemotaxonomy (definition, purpose, chemical classes)	Scientific papers, text books and Internet	x	x	x		x	
				Serotaxonomy (definition, general features, general purposes )	Scientific papers, text books and Internet	x	x	x		x	
				b3	All topics	Scientific papers, text books and Internet	x	x	x		x
2.2.2- Propose solutions to specified problems in	B.4- Advance , develop and modify the methods arise	b4	All topics	Scientific papers, text books and Internet	x	x	x		x		

	the light of the available data (information).	from instrumental techniques in the field of biotechnology.								
General and Transferable Skills	2.4.1- Effective Communication in its different forms.	D.1-Communicate effectively, with colleagues and a wider audience, in a variety of media.	d1	Activity	Scientific papers, text books and Internet		x			x
	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Use the information technologies (IT) in improving the professional practices efficiently.	d1	Activity	Scientific papers, text books and Internet		x			x

# Biosynthesis of natural products

## Course specification of Biosynthesis of natural products

### A- Course specifications:

Program on which the course is given: PhD of Pharmaceutical Sciences

Major or Minor element of program: Major

Department offering the program: Pharmacognosy Dept.

Department offering the course: Pharmacognosy Dept.

Date of specification approval: 2012/2013

### 1- Basic information:

Title: Biosynthesis

Code: Gsp5

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4hrs/week

### 2- Overall aim of the course:

On completion of the course, the students will be able to acquire the knowledge of general aspects for biosynthesis of different classes of natural products as alkaloids, glycosides, volatile oils, and carbohydrates.

### 3. Intended learning outcome s (ILOs):

<b>Knowledge and Understanding</b>	
a1	Acquire the fundamentals of plant physiology and enzymology and also knows the roles of enzymes in biosynthesis processes.
a2	Know the Important chemical reactions of biosynthetic processes.
a3	Acquires the fundamentals of photosynthesis and both 1ry and 2ry metabolites.
a4	Describe the uses of stable and radiolabelled isotopic precursors.
a5	Gain knowledge on the biosynthetic pathways of different classes of alkaloids, terpenoids, aromatic compounds, flavonoids.
<b>Intellectual skills</b>	
b1	Identify scientifically the metabolic products.
b2	Recognize and detect the biosynthetic path ways of different classes of natural products e.g. alkaloids, flavonoids, terpenoids and sesquiterpenes.
b3	Design a practical biosynthetic experiment for a specific natural compounds.
b4	Increase the yield and modify the final products.
<b>General and transferable skills</b>	
d1	Use the library and other sources of information

### 4. Course Content of Biosynthesis:

Week number	Lecture contents (4hrs/week)
1	Plant Cell, Plant Physiology, Types of Enzymes and Mechanism of Enzymes
2	Photosynthesis, 1ry and 2nd metabolites, Isotopes

	Labeling
3	Acetate Pathway: Polyketides, Acetate-Acetate
4	Acetate Pathway: Acetate-malonate, Irregular acetates activity
5	Acetate Pathway: Oxidative phenol coupling, Applications
6	Shikimate Pathway: Simple Phenols, Coumarins.
7	Shikimate Pathway : Flavonoids
8	Shikimate Pathway : Anthraquinones
9	Shikimate Pathway : Other aromatics, Mixed Origin Compounds :
10	Alkaloids Pathway : General aspects, Oxidative phenol coupling in alkaloid biosynthesis
11	Alkaloids Pathway : Alkaloids of mixed amino acids
12	Alkaloids Pathway : Mevalonate origin. activity
13	Alkaloids Pathway : Terpenoid alkaloids
14	Open discussion about the course
15	Open discussion about the course

### **5- Teaching and Learning Methods:**

Lectures

Self learning

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### **6- Student Assessment methods:**

Written exams to assess: a1- a5 and b1- b4

Oral exam assess: a1- a5 and b1- b4

Activity assess: d1

**Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 4-12
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

**Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

**7- References and books:**

**A-Scientific papers**

**B- Essential books:**

- Comprehensive Natural Products Chemistry; Barton, D and Nakanishi, K, Elsevier Science Ltd. (1999) .
- Nat. Prod. Chemistry; Torssel,K.B.G.:Apotekars.press (1997) .
- Natural Products from Plants; Kaufmann, P. B et al; CRC Press (1999).
- Medicinal Natural Products; A Biosynthetic Approach. Dewick, P.M.; John Wiley & Sons (1998).

**C- Suggested books:**

- Organic Chemistry of Secondary Plant Metabolism ; TA Geissman and D.H.G.Crout; Freeman,Cooper & Co. (1969) .

- Biosynthesis of Isoprenoid Compounds; John W.Porter and Sandra L. Spurgeon; vol. 1 , JohnWiley- Interscience Publication, ( 1981).
- Introduction to Alkaloids : A Biogenetic Approach; Geofferey A. Cordell; JohnWiley- Interscience Publication,( 1981).
- The Biosynthesis of Aromatic Compounds ; Ulrich Weis and J. Michael Edwards ; JohnWiley- Interscience Publication,( 1980).
- The Hand Books of Natural Flavonoids; Harborne, J. B. and Baxter, H.; John Wiley & Sons Ltd. (1999).

#### **D- Periodicals and Websites:**

Fitotherapia, Die Pharmazie, Journal of Natural Products,  
Phytochemistry, Planta medica

#### **Facilities required for teaching and learning:**

For lectures: Black (white) boards, computer, data show.

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**Course Coordinators: Prof Dr/ Abdel-monem Ateya**

**Head of Department: Prof Dr/ Sameeh El-Dahmi**

**Date: 2012-11 تم اعتماد التوصيف بمجلس القسم**

Matrix I of Biosynthesis course											
Week number	Course Contents	Knowledge and understanding					Intellectual skills				General and transferable skills
		a1	a2	a3	a4	a5	b1	b2	b3	b4	d1
1	Plant Cell, Plant Physiology Types of Enzymes and Mechanism of Enzymes	x	x	x	x		x				
2	Photosynthesis 1ry and 2nd metabolites Isotopes Labeling	x	x	x	x		x				
3	Acetate Pathway : Polyketides Acetate-Acetate					x		x	x	x	
4	Acetate Pathway : Acetate-malonate Irregular acetates activity					x		x	x	x	x
5	Acetate Pathway: Oxidative phenol coupling Applications					x		x	x	x	
6	Shikimate Pathway: Simple Phenols Coumarins.					x		x	x	x	

7	Shikimate Pathway : Flavonoids					x		x	x	x	
8	Shikimate Pathway : Anthraquinones					x		x	x	x	
9	Shikimate Pathway : Other aromatics Mixed Origin Compounds :					x		x	x	x	
10	Alkaloids Pathway : General aspects Oxidative phenol coupling in alkaloid biosynthesis					x		x	x	x	
11	Alkaloids Pathway : Alkaloids of mixed amino acids					x		x	x	x	
12	Alkaloids Pathway : Mevalonate origin. activity					x		x	x	x	x
13	Alkaloids Pathway : Terpenoid alkaloids					x		x	x	x	
14	Open discussion about the course	x	x	x	x	x	x	x	x	x	
15	Open discussion about the course	x	x	x	x	x	x	x	x	x	

Matrix II of Biosynthesis										
NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment			
					Lectures	Self learning	Written exam	Oral exam	Activity	
Knowledge and Understanding	2.1.1- Fundamentals and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1-Illustrate in-depth knowledge and basic theories of botany, natural products chemistry, biosynthesis, biochemistry, enzymology and cell culture.	a1,a2,a3,a4	Plant Physiology Plant Cell Types of Enzymes Mechanism of Enzymes Photosynthesis 1ry and 2nd metabolites Isotopes Labeling	Scientific papers, text books and Internet	x	x	x	x	
			a5	Acetate-Shikimate-Alkaloids pathways	Scientific papers, text books and Internet	x	x	X	x	

Intellectual Skills	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction)	B.3-Predict bioproducts, mechanism of biosynthetic ways and how to enhance the formation of bioactive metabolites in tissue cultures and biotransformation techniques.	b1	Plant Physiology Plant Cell Types of Enzymes Mechanism of Enzymes Photosynthesis 1ry and 2nd metabolites Isotopes Labeling	Scientific papers, text books and Internet	x	x	x	x	
			b2, b3, b4	Acetate-Shikimate- Alkaloids pathways	Scientific papers, text books and Internet	x	x	X	x	

General and Transferable Skills	2.4.4- Use variable sources to get information and knowledge.	D.4- Make effective use of library and other sources of information in the field of pharmacognosy	d1	Activity	Scientific papers, text books and Internet	x			x
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# Advanced Natural Products Biotechnology

**Course specification of Advanced Natural Products  
Biotechnology**

## A- Course specifications:

Program on which the course is given: PhD of Pharmaceutical Sciences

Major or Minor element of program: Major

Department offering the program: Pharmacognosy Dept.

Department offering the course: Pharmacognosy Dept.

Date of specification approval: 2012/2013

## 1- Basic information:

Title: Advanced Natural Products Biotechnology Code: Gsp6

Lectures: 4 hrs/week Credit hours: 4 hrs/week

Total: 4hrs/week

## 2- Overall aim of the course:

On completion of the course, the students will be able to have the necessary knowledge and gain the skills about the fundamentals and applications of NPB in the field of biotransformation and molecular biology that affects the production of pharmaceutical products.

## 3. Intended learning outcome s (ILOs) of Advanced Natural Products Biotechnology:

Knowledge and Understanding
-----------------------------

a1	Illustrate the principle information about plant gene structure, gene expression and Heterologous expression.
a2	Illustrate the basics of bioinformatics including the use of Gene banks.
a3	Understand the various techniques for plant transformation.
a4	Define plant vectors and recognize new vector-related technologies
a5	Illustrate the applications on plant gene expression.
Intellectual skills	
b1	Recognize Herbicide tolerance and pest resistance.
b2	Recognize Plant disease resistance.
b3	Recognize Molecular pharming.
b4	Recognize Metabolic engineering.
b5	Experience Practical applications and problem solving.
General and transferable skills	
d1	transfer the very high capacity of the data streams that are producing data for molecular biology
d2	work effectively as a member of a team.

#### 4. Course Content of Advanced Natural Products

##### Biotechnology:

Week number	Lecture contents (4hrs/week)
1	Introduction to plant gene structure
2	Introduction to plant gene expression Regulation of gene expression and protein targeting
3	Heterologous expression
4	Introduction to bioinformatics Gene banks
5	Practical applications on the use of gene banks Activity
6	Techniques for plant transformation A) <i>Agrobacterium</i> - based techniques
7	Techniques for plant transformation B) Non- <i>Agrobacterium</i> - based techniques
8	Plant vectors and new vector-related technologies
9	Plant vectors and new vector-related technologies Activity
10	Applications on plant gene expression Herbicide tolerance and pest resistance
11	Applications on plant gene expression Plant disease resistance
12	Applications on plant gene expression Molecular pharming
13	Applications on plant gene expression Metabolic engineering
14	Practical applications and problem solving

15	Practical applications and problem solving
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### 5- Teaching and Learning Methods:

- Lectures
- Self-learning
- Open discussion

### 6- Student Assessment methods:

Written exams to assess: a1- a5 and b1- b5

Oral exam assess: a1- a5 and b1- b5

Activity assess: d1 and d2

#### Assessment schedule:

Assessment (1): Activity	Week 5-9
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

#### Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

### 7- References and books:

#### A-Scientific papers

**B- Essential books:**

- Textbook of Industrial Pharmacognosy ;A.N.Kalia ;CBS(2009).
- Pharmaceutical Biotechnology ;S.S.Purohit,H.N.Kakrani and and A.K.Saluja; Agrobios (2006)
- Pharmaceutical Biotechnology. Crommelin, D.A.; and Sindeler, R.D..Hartwood Academic Publishers. The Netherlands. (1997)
- Pharmacognosy and Pharmacobiotechnology. J.E.Robbers,Marilyn K.Speeddi and VarrE.Taylor;William &Wilkins(1996)
- Plant gene isolation; principles and practice; GaryD.Foster and David Twell; John Wilew & Sons Ltd. (1996).

**Facilities required for teaching and learning:**

For lectures: Black (white) boards, computer, data show.

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**Course Coordinators: Prof Dr/ Azza El-Shafie**

**Head of Department: Prof Dr/ Sameeh El-Dahmi**

**Date: 2012-11 تم اعتماد التوصيف بمجلس القسم**

Matrix I of Advanced Natural Products Biotechnology course													
Week number	Course Contents	Knowledge and understanding					Intellectual skills					General and transferable skills	
		a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	d1	d2
1	Introduction to plant gene structure	x											
2	Introduction to plant gene expression Regulation of gene expression and protein targeting	x											
3	Heterologous expression	x											
4	Introduction to bioinformatics Gene banks		x										
5	Practical applications on the use of gene banks activity		x									x	x
6	Techniques for plant transformation A) Agrobacterium- based techniques			x									
7	Techniques for plant transformation B) Non- Agrobacterium- based techniques			x									
8	Plant vectors and new vector-related technologies				x								

9	Plant vectors and new vector-related technologies activity				x							x	x
10	Applications on plant gene expression Herbicide tolerance and pest resistance					x	x						
11	Applications on plant gene expression Plant disease resistance					x		x					
12	Applications on plant gene expression Molecular pharming					x			x				
13	Applications on plant gene expression Metabolic engineering					x				x			
14	Practical applications and problem solving						x	x	x	x	X		
15	Practical applications and problem solving						x	x	x	x	X		

**Matrix II of Advanced Natural Products Biotechnology**

NARS	Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment			
					Lectures	Self learning	Written exam	Oral exam	Activity	
Knowledge and Understanding	2.1.1- Fundamentals and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.3-Illustrate essential knowledge and applications of plant tissue culture, biotransformation and genetic engineering of plants.	a1	Introduction to plant gene structure - Introduction to plant gene expression Regulation of gene expression and protein targeting - Heterologous expression	Scientific papers, text books and Internet	x	X	x	x	
			a2	Introduction to bioinformatics Gene banks Practical applications on the use of gene banks	Scientific papers, text books and Internet	x	X	x	x	
			a3	Techniques for plant transformation A) Agrobacterium- based techniques - B) Non-	Scientific papers, text books and Internet	x	X	x	x	

				Agrobacterium- based techniques						
			a4	Plant vectors and new vector-related technologies	Scientific papers, text books and Internet	x	X	x	x	
			a5	Applications on plant gene expression Herbicide tolerance and pest resistance- Plant disease resistance- Molecular pharming- Metabolic engineering	Scientific papers, text books and Internet	x	X	x	x	
Intellectual Skills	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction)	B.3-Predict bioproducts, mechanism of biosynthetic ways and how to enhance the formation of bioactive metabolites in tissue cultures and	b1	Herbicide tolerance and pest resistance- Practical applications and problem solving	Scientific papers, text books and Internet	x	X	x	x	
			b2	Plant disease resistance- Practical applications and problem solving	Scientific papers, text books and Internet	x	X	x	x	

		biotransformation techniques.	b3	Molecular pharming- Practical applications and problem solving	Scientific papers, text books and Internet	x	X	x	x	
			b4	Metabolic engineering- Practical applications and problem solving	Scientific papers, text books and Internet	x	X	x	x	
			b5	Practical applications and problem solving	Scientific papers, text books and Internet	x	X	x	x	
<b>General and Transferable Skills</b>	2.4.1- Communicate effectively.	D.1- Apply effective communication skills recognizing the need for a variety of approaches.	d1	activity	Scientific papers, text books and Internet	x				X

	2.4.6- Work as a member and lead a team of workers.	D.6- Implement tasks as a member and lead a team of workers.	d2	activity	Scientific papers, text books and Internet	x					x
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# PhD Thesis Specification

## Thesis Specification of PhD Degree

### A- Course specifications:

Program on which the course is given: PhD of Pharmaceutical sciences  
(Pharmacognosy)

Major or Minor element of program: Major  
Department offering the program: Pharmacognosy Dept.  
Department offering the thesis: Pharmacognosy Dept.  
Date of specification approval: 2012/2013

### 1- Basic information:

Title: DhP Thesis in Pharmacognosy  
Credit hours: 30 hrs

### 2- Overall aim of the thesis:

On completion of the thesis, the students will be able to:

- Outline the possible protocol for solving harsh problem that the candidate can work after integrating suitable knowledge about this point of research
- Identify and perform different techniques and methods used in the experimental work according to the designed protocol
- Derive and present the results of the study from the data collected
- Analyze the results of the study in the light of prior knowledge

- Draw conclusions about the contribution to knowledge made by the study which may be concerned with the problem under investigation, the methods deployed or the student as researcher

### 3- Intended learning outcome's (ILOs):

Knowledge and Understanding	
a1	Determine methods, techniques and ethics of scientific research.
a2	Understand the legal aspects for professional and academic practices.
a3	Be aware with the requirements of quality to apply them during practical work.
a4	Determine the influence of the research on the society and community problems.
Intellectual skills	
b1	Advance, develop and modify the methods arise from instrumental techniques in the field of biotechnology.
b2	Conduct research studies that add to the current knowledge.
b3	Write scientific papers on the research results.
b4	Manage hazards that may rise during practical work.
b5	Apply and evaluate techniques that improve the performance.
b6	Take professional decisions and bears responsibility.
b7	Demonstrate creativity and innovation in modifying techniques.
b8	Manage discussions during presenting the results.
Professional and practical skills	

c1	Identify and make taxonomical citation of crude drugs.
c2	Extract, isolate, purify and identify natural constituents using physical, chemical and chromatographic techniques.
c3	Select proper media and adjust the conditions for tissue culture.
c4	Design and efficiently perform genetic engineering and biotechnology experiments for plant products in analytical and preparative scales.
c5	Write and critically evaluate professional reports in the field of natural product and other related fields.
c6	Construct a critical review of existing literature or other scholarly output.
c7	Modify the work through continuous evaluation to the used methods and tools.
c8	Use IT skills in collecting information, presenting results and writing thesis
c9	Modify laboratory techniques.
General and Transferable skills	
d1	Interact effectively with supervisors, team members and various professionals.
d2	Use information technology in review and thesis preparation.
d3	Set rules for evaluation and judge others performance.
d4	Study independently and evaluate learning needs in pharmacognosy field.
d5	Collect required information from various sources.

d6	Work effectively as a member of a team.
d7	Direct scientific meetings and use time effectively to achieve goals.

#### 4. Thesis Content:

Steps	Content
1 <sup>st</sup>	<p>Suggest the possible points/ problems of research that the candidate can work on in the frame of the aim of work and choose proper point related to the problems of the community and surrounding environment.</p> <p>Collect all available information about this subject by all possible means.</p> <p>Use internet, journals, books and other trusted sources of information to get previous and recent data and information about the subject understudy.</p> <p>Design protocol including the steps of work following a proper schedule.</p> <p>Increase the awareness of the recent techniques that can be used during practical work and determined by the protocol.</p> <p>Integrate different knowledge required to solve suggested problem.</p> <p>Continuous evaluation to the thesis outcome according to the schedule.</p>
2 <sup>nd</sup>	Apply different practical techniques for separation and purification of different classes of natural products.

	<p>Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</p> <p>Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</p> <p>Modify methods for production of active constituents using plant tissue culture.</p> <p>Evaluate and manage hazards throughout the whole practical work.</p> <p>Organize the experimental work according to the designed protocol.</p> <p>Apply ethical recommendations in all aspects of scientific research e.g. citation, publication.....</p>
3 <sup>rd</sup>	<p>Select some of the compounds for their pharmacological or microbiological activities.</p> <p>Interpret the biological results.</p> <p>Perform statistical analysis and biological correlation for the results.</p> <p>Present and describe the results graphically.</p> <p>Understand any legal aspects related to the thesis work.</p>
4 <sup>th</sup>	<p>Communicate with supervisors to discuss results.</p> <p>Work effectively as a member of a team (e.g. Supervisors and various professionals).</p> <p>Present the results periodically in seminars.</p> <p>Write scientific reports on the obtained results with conclusive</p>

<p>significance.</p> <p>Discuss obtained results in comparison with pervious literatures.</p> <p>Suggest possible recommendations based on the outcome of the thesis and decide future plans.</p> <p>Present the thesis in a written form.</p> <p>Summarize the thesis in an understandable Arabic language for non professionals.</p> <p>Write references in the required form (Thesis, Paper.....).</p> <p>Demonstrate the thesis in a final power point presentation.</p> <p>Continue self-learning throughout the experimental work and writing scientific papers.</p>
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### 5- Teaching and Learning Methods:

- Self learning (Activities, Research....)
- Open discussion

### 6- References:

- Websites: Pubmed, Sciencedirect, Wileyinterscience

#### Facilities required for:

For practical work: Rotary evaporator, UV lamp, UV spectrophotometer, IR spectrophotometer, NMR spectrophotometer, Mass spectrophotometer, PHmeter, Hot plate stirrer, condensation unit, oil isolation unit, incubators, microscopes

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Head of Department: Prof. Dr. Sameeh Eldahmi

PhD Thesis (Pharmacognosy)				
NARS		Program ILOs	Thesis ILOs	Thesis content
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.4- Illustrate the Fundamentals, methods, techniques, tools and ethics of scientific research.	Determine methods, techniques and ethics of scientific research.	<ul style="list-style-type: none"> <li>• Design protocol including the steps of work following a proper schedule.</li> <li>• Increase the awareness of the recent techniques that can be used during practical work and determined by the protocol.</li> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Apply ethical recommendations in all aspects of scientific research e.g. citation, publication.....</li> </ul>
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.5- State the ethical and legal principles in pharmacy and academic practices.	Understand the legal aspects for professional and academic practices.	<ul style="list-style-type: none"> <li>• Understand any legal aspects related to the thesis work.</li> </ul>

	<p>2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.</p>	<p>A.6- Illustrate the principles and bases of quality assurance in professional practice in the field of isolation and elucidation of natural products and in biotransformation and genetic engineering techniques.</p>	<p>Be aware with the requirements of quality to apply them during practical work.</p>	<ul style="list-style-type: none"> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>
	<p>2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.</p>	<p>A.7-Verify the relevant knowledge concerning the impact of professional practice of the field of natural product research on society and environment.</p>	<p>Determine the influence of the research on the society and community problems.</p>	<ul style="list-style-type: none"> <li>• Suggest the possible points/problems of research that the candidate can work on in the frame of the aim of work and choose proper point related to the problems of the community and surrounding environment.</li> </ul>

	<p>2.2.2- Propose solutions to specified problems in the light of the available data (information).</p>	<p>B.4- Advance , develop and modify the methods arise from instrumental techniques in the field of biotechnology.</p>	<p>Advance , develop and modify the methods arise from instrumental techniques in the field of biotechnology.</p>	<ul style="list-style-type: none"> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>
	<p>2.2.3- Conduct research studies that add to the current knowledge.</p>	<p>B.5- Conduct research studies that add to the current knowledge.</p>	<p>Conduct research studies that add to the current knowledge.</p>	<ul style="list-style-type: none"> <li>• Present the results periodically in seminars.</li> <li>• Write scientific reports on the obtained results with conclusive significance.</li> <li>• Discuss obtained results in comparison with pervious literatures.</li> <li>• Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li> </ul>
	<p>2.2.4- Formulate scientific papers.</p>	<p>B.6-Formulate scientific papers.</p>	<p>Write scientific papers on the research results.</p>	<ul style="list-style-type: none"> <li>• Continue self-learning throughout the experimental work and writing scientific papers.</li> </ul>

	<p>2.2.5- Asses hazards and risks in professional practice in his \ her areas of specialization.</p>	<p>B.7- Assess hazards and risks in Pharmacognosy field.</p>	<p>Manage hazards that may rise during practical work.</p>	<ul style="list-style-type: none"> <li>• Evaluate and manage hazards throughout the whole practical work.</li> </ul>
	<p>2.2.6- Plan to improve performance in the pharmaceutical area of interest.</p>	<p>B.8- Plan to improve performance in the Pharmacognosy field.</p>	<p>Apply and evaluate techniques that improve the performance.</p>	<ul style="list-style-type: none"> <li>• Integrate different knowledge required to solve suggested problem.</li> <li>• Continuous evaluation to the thesis outcome according to the schedule.</li> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Modify methods for production of active constituents using plant tissue culture.</li> </ul>

	2.2.7- Take Professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.9- Take professional decisions and bears responsibility.	Take professional decisions and bears responsibility.	<ul style="list-style-type: none"> <li>• Integrate different knowledge required to solve suggested problem.</li> <li>• Continuous evaluation to the thesis outcome according to the schedule.</li> </ul>
	2.2.8- Be creative and innovative.	B.10- Be creative and innovative.	Demonstrate creativity and innovation in modifying techniques.	<ul style="list-style-type: none"> <li>• Modify methods for production of active constituents using plant tissue culture.</li> </ul>
	2.2.9- Manage discussions and arguments based on evidence and logic.	B.11- Manage discussions and arguments based on evidence and logic.	Manage discussions during presenting the results.	<ul style="list-style-type: none"> <li>• Present the results periodically in seminars.</li> </ul>
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Identify and make taxonomical citation of crude drugs.	Identify and make taxonomical citation of crude drugs.	<ul style="list-style-type: none"> <li>• Apply ethical recommendations in all aspects of scientific research e.g. citation, publication.....</li> </ul>
		C.2- Extract, isolate, purify and identify natural constituents using physical, chemical and chromatographic techniques.	Extract, isolate, purify and identify natural constituents using physical, chemical and chromatographic techniques.	<ul style="list-style-type: none"> <li>• Apply different practical techniques for separation and purification of different classes of natural products.</li> </ul>

	C.3- Select proper media and adjust the conditions for tissue culture.	Select proper media and adjust the conditions for tissue culture.	<ul style="list-style-type: none"> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>
	C.4- Design and efficiently perform genetic engineering and biotechnology experiments for plant products in analytical and preparative scales.	Design and efficiently perform genetic engineering and biotechnology experiments for plant products in analytical and preparative scales.	<ul style="list-style-type: none"> <li>• Use different spectroscopic techniques for structure elucidation of natural products (1HNMR, 13CNMR, Mass spectroscopy, IR, UV)</li> <li>• Apply modern methods for production of secondary metabolites including plant tissue culture and plant biotechnology.</li> </ul>
	C.5- Write and critically evaluate professional reports in the field of natural product and other related fields.	Write and critically evaluate professional reports in the field of natural product and other related fields.	<ul style="list-style-type: none"> <li>• Present the thesis in a written form.</li> </ul>
	C.6- Construct a critical review of existing literature or other scholarly output.	Construct a critical review of existing literature or other scholarly output.	<ul style="list-style-type: none"> <li>• Present the thesis in a written form.</li> <li>• Discuss obtained results in comparison with pervious literatures.</li> </ul>
2.3.2- Write and critically evaluate professional reports.			

<p>2.3.3- Evaluate and develop methods and tools existing in the area of specialization.</p>	<p>C.7- Evaluate and develop methods and tools existing in the field of natural product.</p>	<p>Modify the work through continuous evaluation to the used methods and tools.</p>	<ul style="list-style-type: none"> <li>• Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li> <li>• Select some of the compounds for their pharmacological or microbiological activities.</li> <li>• Interpret the biological results.</li> </ul>
<p>2.3.4- Properly use technological means in a better professional practice.</p>	<p>C.8- Properly use technological means in a better professional practice.</p>	<p>Use IT skills in collecting information, presenting results and writing thesis</p>	<ul style="list-style-type: none"> <li>• Use internet, journals, books and other trusted sources of information to get previous and recent data and information about the subject under study.</li> <li>• Perform statistical analysis and biological correlation for the results.</li> <li>• Present and describe the results graphically.</li> <li>• Demonstrate the thesis in a final power point presentation.</li> </ul>

	2.3.5- Plan to improve professional practice and to improve the performance of other scholars.	C.9- Plan to improve professional practices and to improve the performance of other scholars.	Modify laboratory techniques.	<ul style="list-style-type: none"> <li>• Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li> <li>• Modify methods for production of active constituents using plant tissue culture</li> </ul>
General and Transferable Skills	2.4.1- Effective Communication in its different forms.	D.1-Communicate effectively, with colleagues and a wider audience, in a variety of media.	Interact effectively with supervisors, team members and various professionals.	<ul style="list-style-type: none"> <li>• Communicate with supervisors to discuss results.</li> <li>• Work effectively as a member of a team (e.g. Supervisors and various professionals).</li> </ul>
	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Use the information technologies (IT) in improving the professional practices efficiently.	Use information technology in review and thesis preparation.	<ul style="list-style-type: none"> <li>• Use internet, journals, books and other trusted sources of information to get previous and recent data and information about the subject under study.</li> <li>• Perform statistical analysis and biological correlation for the results.</li> <li>• Present and describe the results graphically.</li> <li>• Demonstrate the thesis in a final power point presentation.</li> </ul>

<p>2.4.3- Help others to learn and evaluate their performance.</p>	<p>D.3- Help others to learn and evaluate their performance</p>	<p>Set rules for evaluation and judge others performance.</p>	<ul style="list-style-type: none"> <li>• Work effectively as a member of a team (e.g. Supervisors and various professionals).</li> <li>• Discuss obtained results in comparison with pervious literatures.</li> </ul>
<p>2.4.4- Self-assessment and continuous learning.</p>	<p>D.4- Continue to learn independently and to develop professionally.</p>	<p>Study independently and evaluate learning needs in pharmacognosy field.</p>	<ul style="list-style-type: none"> <li>• Continue self-learning throughout the experimental work and writing scientific papers.</li> </ul>
<p>2.4.5- Use various sources to get information and knowledge.</p>	<p>D.5- Use various sources to get information and knowledge.</p>	<p>Collect required information from various sources.</p>	<ul style="list-style-type: none"> <li>• Collect all available information about this subject by all possible means.</li> <li>• Use internet, journals, books and other trusted sources of information to get previous and recent data and information about the subject understudy.</li> </ul>
<p>2.4.6- Work as a member and lead a team of workers.</p>	<p>D.6- Implement tasks as a member and lead a team of workers.</p>	<p>Work effectively as a member of a team.</p>	<ul style="list-style-type: none"> <li>• Work effectively as a member of a team (e.g. Supervisors and various professionals).</li> </ul>

	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Direct scientific meetings and manage time effectively.	Direct scientific meetings and use time effectively to achieve goals.	<ul style="list-style-type: none"><li>• Organize the experimental work according to the designed protocol.</li><li>• Present the results periodically in seminars. •</li></ul> Demonstrate the thesis in a final power point presentation.
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