FUTURE UNIVERSITY IN EGYPT
FACULTY OF PHARMACEUTICAL SCIENCES AND PHARMACEUTICAL INDUSTRIES

Course Specifications

General Botany and Medicinal Plants (PHG 101)

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All Faculty Departments
Department offering the course:	Pharmacognosy and Medicinal Plants
Academic year:	2014/2015
Approval Date:	September 2014

A. Basic Information

Course Title: General Botany and Medicinal Plants **Course Code: PHG 101**

Prerequisites: ---

Students' Level/Semester: First Level/ First Semester

Credit hours: **3 (2+1)**

Actual teaching hours per week:

Lectures: 2/week **Practical:** 2/week **Tutorial:** N/A **Total:** 4/week

B. Professional Information

1. Overall Aim of Course

Upon successful completion of this course: the students will be able to demonstrate knowledge of basic concept in the principle of Pharmacognosy and relate medicinal actions of medicinal plants to their content of secondary metabolites. Students are supposed to have an overview of the steps of commerce production of medicinal plants to the market, differentiate between different classes of plant kingdom and describe plant cell membrane. The students should be also able to discuss role of these medicinal plant leaves in the treatment of different diseases.

2. Intended Learning Outcomes (ILOs)

By the end of the course, student should be able to:

a- Knowledge and Understanding:

a1. Illustrate the proper collection and storage methods of medicinal plants. Apply this knowledge in marketing of medicinal plants.
a2. Identify medicinal plant leaves in both their entire and powdered forms.
a3. Enumerate different plant secondary metabolites.
a4. Identify the presence of these compounds by chemical reaction.
a5. Describe the histological structure of the medicinal plant leaves.
a6. Demonstrate knowledge of the active constituents of the lower and higher medicinal plants (secondary metabolites).

b- Intellectual Skills:

b1. Recognize the unknown plant leaves morphologically.

b2. Detect the unknown plant leaves microscopically.
b3. Evaluate the purity of the medicinal drug.
b4. Detect adulteration of a given drug.
b5. Outline the main differences between different plant parts; roots, stems, leaves, etc.

c- Professional and Practical Skills:

c1. Handle the microscope.
c2. Manipulate the microscopical specimens.
c3. Classify any plant taxonomically.
c4. Perform experiments for detection of different plant secondary metabolites.
c5. Perform experiments for detection of adulteration.

d- General and Transferable Skills:

d1. Work effectively in team with minimal guidance where appropriate.
d2. Demonstrate written and oral communication skills.
d3. Communicate effectively with others.

3. Contents

Teaching Weeks	Topic	No. of hours	Lecture	Practical
One	Orientation, general introduction	**4**	**2**	
	Orientation ; instructions for laboratory			**2**
Two	Definitions, main topics for description; Different classification of crude drugs classifications of drugs; viz. alphabetical, chemical, taxonomical, pharmacological.	**4**	**2**	
	How to use microscope, how to prepare microscopical mounts; identification of potato starch & maize starch & how to write scheme for their description			**2**
Three	Geographical and commercial origins. Comparison between cultivation and wild sources.	**4**	**2**	
	Identification of rice starch & wheat starch and how to write scheme for their description			**2**
Four	Collection and different methods of	**4**	**2**	

	drying of crude drugs + **First Midterm Exam**			
	Identification of Dusting Powders: Talc, Chalk and Diatoms and how to write scheme for their description/ Revision			**2**
Five	Adulteration of crude drugs.	**4**	**2**	
	Practical exam-1			**2**
Six	Introduction to plant secondary metabolites, differences between primary & secondary metabolites	**4**	**2**	
	Microscopical Examination of different types of Ca-ox			**2**
Seven	Plant Taxonomy: Classification to flowerless plants	**4**	**2**	
	Introduction of leaves: composition of leaf base, leaf petiole, leaf lamina, lamina shapes, apex, leaf margin, venation.			**2**
Eight	**Second Midterm exam**			
Nine	Plant Taxonomy: Classification of flowering plants	**4**	**2**	
	Microscopical examination of Epidermal cells and different types of stomata; trichomes (glandular and non-glandular)			**2**
Ten	General introduction to leaves, functions, different parts, insertion, phyllotoxis Morphological and Microscopical characterization of the leaves. Medicinal plants: Senna; origin, main diagnostic elements, chemical tests, active constituents and uses.	**4**	**2**	
	Macro and Microscopical Examination of Senna leaf (T.S & powder) + Digitalis leaf.			**2**
Eleven	Medicinal plants: Datura, Hyoscyamus, Belladonna; origin, active constituents, chemical tests,	**4**	**2**	

	main diagnostic elements			
	Macro and Microscopical Examination of Hyoscyamus (T.S and powder)-			**2**
Twelve	Medicinal plants: Digitalis, Boldo, Buchu; origin, active constituents, chemical tests, main diagnostic elements	**4**	**2**	
	Revision			**2**
Thirteen	Revision	**4**	**2**	
	Practical Exam-2			**2**
Total No. of hours		**48**	**24**	**24**
Fourteen	**Final Exams of Faculty**			
Fifteen				
Sixteen				

4. Teaching and Learning Methods

4.1. Lectures (Tools: board, data show).

4.2. Practical Session

4.3. Assignments, researches and posters.

5. Student Assessment Methods

5.1. Written exam(s) **to assess** knowledge and understanding and intellectual skills.

5.2. Practical exam(s) **to assess** practical skills.

5.3. Oral exam **to assess** knowledge, understanding, and intellectual skills, as well as, general and transferable skills.

5.4. Semester Work (Assignments, researches, presentations and posters) to assess general and transferable skills.

Assessment Schedule

Assessment 1	**First Midterm exam**	Week 4
Assessment 2	**Practical exam-1**	Week 5
Assessment 3	**Second Midterm**	Week8
Assessment 4	**Practical exam-2**	Week 13
Assessment 5	**Final Written exam**	Week 15/16
Assessment 6	**Oral exam**	Week 15/16
Assessment 7	**Semester Work (Assignments)**	During the semester

Weighing of Assessments

Mid-Term Examination	20%
Final-Term Examination	30%
Oral Examination	10%
Practical Examination	30%
Semester Work	10%
(Assignments, researches, presentations and posters)	
Total	**100%**

6. List of References

6.1. Course Notes

Lab. manual prepared by instructors.

Lecture hand out given part by part

6.2. Essential Books (Text Books)

- Trease, G.E. & Evans, W.C.; Pharmacognosy, W.B. Saunders Publishers, Ltd, 16th ed., 2006

6.3. Recommended Books

- Barnes, J., Anderson, L. A. and Phillipson, J. D.: "Herbal medicines" Pharmaceutical Press, 3rd ed., 2007.
- Egyptian Pharmacopoeia, English Text, (4th Ed.), Egyptian Government, http://www.egypt.gov.eg/arabic/default.asp, 2005.
- J. Bruneton: "Pharmacognosy, Phytochemistry, Medicinal Plants" Lavoisier Publishing, Intercept 2nd ed., 2008.
- Walter Hepworth Lewis, Medical Botany: Plants Affecting Human Health 2nd Ed, John Wiley & Sons, New Jersey, 2003.

6.4. Periodicals, Websites, ……etc

- Vascular plant image library

http://botany.csdl.tamu.edu/FLORA/gallery.htm

- A modern herbal

http://www.botanical .com

7. Facilities Required for Teaching and Learning

Study halls, laboratories, microscopes, chemicals, glassware, books, audio-visual tools, boards, instruments,

Course Coordinator
Dr. Moushira Shokry

Head of Department

Prof. Dr. Miriam Youssef

Department Approval Date: September 2014

FUTURE UNIVERSITY IN EGYPT
FACULTY OF PHARMACEUTICAL SCIENCES AND PHARMACEUTICAL INDUSTRIES

Course Specifications

Pharmacognosy 1 (PHG 111)

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All Faculty Departments
Department offering the course:	Pharmacognosy and Medicinal Plants
Academic year:	2014/2015
Approval Date:	September 2014

A. Basic Information

Course Title: Pharmacognosy 1 **Course Code: PHG 111**

Prerequisites: Botany and Medicinal Plants, PHG 101

Students' Level/Semester: First Level/ second Semester

Credit hours: **4 (3+1)**

Actual teaching hours per week:

Lectures: 3/week **Practical:** 2/week **Tutorial:** N/A **Total:** 5/week

B. Professional Information

1. Overall Aim of Course

Develop skills and knowledge concerning handling, authentication and/or quality assurance of medicinal plants when present either in entire or powdered forms and provide pharmacy students with different medicinal applications of herbal drugs and their active constituents and to familiarize students with herbs currently in use in the market.

2. Intended Learning Outcomes (ILOs)

By the end of the course, student should be able to

a- Knowledge and Understanding:

a1. Describe methods for detection and identification of natural drugs, especially flowers, macro- and micro-morphologically and chemically.

a2. Recognize methods for detection and identification of natural drugs, especially fruits, macro- and micro-morphologically and chemically.

a3. Identify methods for detection and identification of natural drugs, especially barks, macro- and micro-morphologically and chemically.

a4. Discuss methods for selection of genuine natural drugs.

b- Intellectual Skills:

b1. Design suitable natural drug formulations whether in entire, powdered forms, or according to pharmacopoeial criteria.

b2. Evaluate the quality of natural drug sample.

b3. Compare between a given sample and the respective pharmacopoeial one.

b4. Select methods for differentiation between pharmacopoeial grade, varieties and adulterants of genuine drugs.

b5. Select methods for choice of suitable natural drugs, taking in consideration patient history in each case

c- Professional and Practical Skills:

c1**.** Deduce an unknown natural drug whether in entire or powdered form.

c2**.** Prepare an unknown natural drug for the aim of identification by chemical tests.

c3**.** Evaluate the quality of natural drug sample.

c4. Relate a given sample and the respective pharmacopoeial one**.**

d- General and Transferable Skills:

d1**.** Practice professional competence in literature retrieval skills.

d2. Manage own learning using the full range of resources.

d3**.** Demonstrate professional competence in internet**.**

d4**.** Work autonomously or with minimal guidance where appropriate.

3. Contents

Teaching Week	Topic	No. of hours	Lecture	Practical
One	Introduction of flowers: Definition, typical flower, calyx, corolla, androecium & gynoecium, methods of pollination, placentation, types of inflorescence {racemose & cymose}	**5**	**3**	
	Orientation- Introduction to Flowers			**2**
Two	Clove, origin, macro-& micro-morphological characters, active constituents, uses & adulterants. Lavender (morph., powder, active constituents, uses) Characters of the flowers of family Compositae: German & roman chamomile (origin, macro-& micro- morphological characters, active constituents, uses)	**5**	**3**	
	Clove (Morph.) + powder) Lavender, German Chamomile (Morph., powder)			**2**
Three	Pyrethrum, origin, macro-& micro- morphological characters, active constituents, test for identity. & uses, Santonica,	**5**	**3**	

	Karkadeh, Saffron, Safflower, Calendula.			
	Pyrethrum (Morph. +Powder) & Calendula Revision powdered flowers			**2**
Four **(1st Midterm Ex.)**	Introduction of fruits Introduction of umbelliferous fruits-	**5**	**3**	
	Introduction to Fruits, Fennel (Morph., TS & powder)			**2**
Five	Fennel, Anise (star anise & adulterant), Coriander (Origin, macro, macro and micro-morphological characters, constituents & uses)	**5**	**3**	
	Anise, *Ammi visnaga*, (Morph., TS, powder.)			**2**
Six	*Ammi visnaga*, *A. majus*, (Morph., TS, powder. constituents, chemical tests & uses). Bitter orange peel, (origin, constituents & uses)	**5**	**3**	
	Coriander (Morph, T.S. +Powder), Revision Fruit powders			**2**
Seven	Senna pods (Morph., constituents, chemical tests & uses) Colocynth, Capsicum (origin, active constituents, & uses), milk thistle (origin, constituents & uses)	**5**	**3**	
	Introduction of bark, Cinchona, Cinnamon (morphology, TS, powder.			**2**
Eight	**Second Midterm Exam**			
Nine	Introduction of bark, Cinchona, (macro-& micro-morphological characters, active constituents, chemical tests, uses.	**5**	**3**	
	Revision			**2**
Ten	Pomengranate, Cinnamon and Cassia (origin, (morphology, TS, powder, constituents, uses, chemical tests)	**5**	**3**	
	Presentation			**2**
Eleven	Cascara, Frangula (origin, constituents, test and uses),	**5**	**3**	

	Quillaia & Salix: active constituents, uses, chemical test)			
	PRACTICAL EXAM			**2**
Twelve	Introduction to wood. Definition & types, Quassia & Guaiacum origin, active constituents, uses, chemical tests.	**3**	**3**	
				-
Thirteen	Galls & REVISION	**3**	**3**	
				-
Total No. of Hours		**56**	**36**	**20**
Fourteen	University Electives Final exam			
Fifteen	Final exams of Faculty			
Sixteen				

4. Teaching and Learning Methods

4.1. Modified lectures.

4.2. Presentation and projects

4.3. Modified labs with open discussions.

5. Student Assessment Methods

5.1. Written exam to assess understanding and comprehension.

5.2. Practical Exam: to assess practical skills for identification of vegetable powders.

5.3. Oral exams to assess communication skills and transferable skills.

5.4. Semester Work (Assignments + Presentation) to assess all types of skills

Assessment Schedule

Assessment 1	1st midterm exam	Week 4
Assessment 2	2nd midterm exam	Week 8
Assessment 3	Practical exam	Week 11
Assessment 4	Final exam	Week 15/16
Assessment 5	Oral exam	Week 15/16
Assessment 6	Assignments	During the semester
Assessment 7	Presentation	Week 10

Weighing of Assessments

Final-Term Examination	30 %
1st midterm examination	5 %
2nd midterm examination	15 %
Practical examination	30 %
Oral examination	10 %
Semester work (Assignments + Presentations)	10 %
Total	**100 %**

6. List of References

6.1. Lecture handouts**,** Lectures and Lab on MOODLE**.**
Lab manual

6.2. Essential Books (Text Books)

- Evans, W. C. (2010): Trease and Evans Pharmacognosy, Edinburgh, London, New York, Oxford, Philadelphia, St. Louis and Toronto, 16th ed, Elsevier.

6.3. Recommended Books

- Narayana, P. S., Pullaiah, T., Varalakshmi, D., Vol.2 (2014): Textbook of Pharmacognosy, CBS Publishers.
- Heinrich, M., Barnes, J. Gibbons S., and E. M. Williamson (ed) (2012): Fundamentals of Pharmacognosy and Phytotherapy, (2nd Ed), Elsevier.
- Egyptian Pharmacopoeia, English Text (2005), (4th Ed.), Egyptian Government, http://www.egypt.gov.eg/arabic/default.asp
- Duke, J.A., Godwin, M.J.B., Ducellier, J. and Duke, P.A.K. (2003): "CRC Handbook of Medicinal Spices", CRC press, London, New York, Washington.
- Blumenthal, M (ed). (2000): "Herbal Medicine- Expanded Comission E Monographs", Integrative Medicine Communications, USA.
- Wallis, T.E. (1999): "Text book of Pharmacognosy", 5th Ed., CBS publishers and Distributors, India.

6.4. Periodicals, Websites, ……etc

-http://www.bestnetcraft.com/spicy_recipes.pdf

-http://www.herbdatanz.com/index.htm

-http://www.who.int/medicines/library/trm/medicinalplants.pdf

http://www. herb.com/

7. Facilities Required for Teaching and Learning

7.1 Whiteboard, screen, video projector.

7.2 Dried plant samples, glassware: Slides, covers, fixed slides of natural drugs.
7.3 Light microscopes, slide show of microscopic slides using video projector.

Course Coordinator
Miriam F. Yousif

Head of Department
Miriam F. Yousif
Department Approval Date: Sept. 2014

Pharmacognosy 2 (PHG 212)

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All departments
Department offering the course:	Pharmacognosy and Medicinal Plants
Academic year:	2014/2015
Date of specifications approval:	Sept. 2014

A. Basic Information

Course Title: **Pharmacognosy 2** **Course Code: PHG 212**

Prerequisites: General Botany and Medicinal Plants, PHG 101

Students' Level/Semester: Second level /Third semester

Credit Hours: **4 (3+1)**

Actual teaching hours per week

Lecture: 3 hrs/week **Practical:** 2hrs/week **Tutorial:** N/A **Total:** 5 hrs

B. Professional Information

1. Overall Aim of Course

After completion of the course the student should have the knowledge and skills that enable her/ him to differentiate between different organs of an herb including seeds and subterranean organs, identify active constituents and adulterants, describe micro- and macro-morphological characteristics, relate pharmaceutical actions to the possible uses and side effects and have an overview over the phytopharmaceuticals available on the market.

2. Intended Learning Outcomes (ILOs)

By the end of the course, student should be able to

a- Knowledge and Understanding:

a1. Describe methods for identification of natural drugs, specially seeds, macro-morphologically.

a2. Identify methods for detection of natural drugs, specially seeds micro-morphologically and chemically.

a3. List methods for detection and identification of herbs, macro- and micro-morphologically and chemically.

a4. Outline methods for detection and identification of natural unorganized drugs chemically.

a5. Recognise methods for detection and identification of natural drugs composed of subterranean organs, macro- and micro-morphologically and chemically.

a6. Discuss methods for selection of genuine natural drugs.

a7.Indicate methods for differentiation between pharmacopoeial grade, varieties and adulterants

b- Intellectual Skills:

b1. Design suitable natural drug formulations whether in entire or powdered forms, according to pharmacopoeial criteria.

b2. Evaluate the quality of natural drug sample.

b3. Compare between a given sample and the respective pharmacopoeial one.

b4. Select methods for choice of suitable natural drugs taking in consideration patient history in each case**.**

c- Professional and Practical Skills:

c1. Deduce an unknown natural drug whether in entire or powdered form.

c2. Extract an unknown natural drug for the aim of identification by chemical tests.

c3-Evaluate the quality of natural drug sample and compare between a given sample and the respective pharmacopoeial one**.**

d- General and Transferable Skills:

d1. Practice professional competence in internet and literature retrieval skills.

d2. Work in a team with minimal guidance where appropriate.

d3. Apply self -learning using the different resources.

d4. Set realistic targets

d5. Plan work and time to meet targets within deadlines.

3- Contents

Week	Topic	No. of hours	Lecture	Practical
One	Introduction of seeds Introduction of herb	**5**	**3**	

Assessment Schedule

First mid-term exam	Week 4
Second Mid-term exam	Week 8
Practical examination-1	Week 9
Practical examination-2	Week 12
Final-Term Examination	Week 15/16
Oral examination	Week 15/16
Semester Work (Assignments)	During the semester

Weighing of Assessments

5th week exam	5%
Mid-Term Examination	15%
Final-Term Examination	30%
Oral Examination	10%
Practical Examination	30%
Semester Work (Assignments)	10%
Total	100%

6. List of References

6.1. Course Notes

Lecture handouts Weekly

6.2. Essential Books (Text Books)

Evans, W. C. (2010): Trease and Evans Pharmacognosy, Edinburgh, London, New York, Oxford, Philadelphia, St. Louis and Toronto, 16th ed, Elsevier.

6.3. Recommended Books

- Narayana, P. S., Pullaiah, T., Varalakshmi, D., Vol.2 (2014): Textbook of Pharmacognosy, CBS Publishers.
- Heinrich, M., Barnes, J. Gibbons S., and E. M. Williamson (ed) (2012): Fundamentals of Pharmacognosy and Phytotherapy, (2nd Ed), Elsevier.
- Egyptian Pharmacopoeia, English Text (2005), (4th Ed.), Egyptian Government, http://www.egypt.gov.eg/arabic/default.asp
- Duke, J.A., Godwin, M.J.B., Ducellier, J. and Duke, P.A.K. (2003) ³&5& +EDRQRGN RI 0HGLFLQDO 6SLFHV CRC press, London, New York, Washington.

- %OXPHQWKDO 0HG - ³+HUEDO ([SDQGHG &RPLVVLRQ (0RQRJUDSKV´ , Medicine Communications, USA.
- Wallis, T.E. ³7H[W ERRN RI 3KDUPDFRJQRV Ed., CBS publishers and Distributors, India.

6.4. Periodicals, Websites, ……etc

- http://www.bestnetcraft.com/spicy_recipes.pdf
- http://www.herbdatanz.com/index.htm
- http://www.who.int/medicines/library/trm/medicinalplants.pdf

7. Facilities Required for Teaching and Learning

7.1. Whiteboard, screen, transparent sheets, overhead projector, video projector.

7.2. Fresh and dried plant samples, glassware: Slides, covers, fixed slides of natural drugs.

7.3. Light microscopes, slide show of microscopic slides using video projector.

Course Coordinator
Miriam F. Yousif

Head of Department
Miriam F. Yousif
Department approval Date: September 2014

Phytochemistry-1 (PHG 221)

Course Specifications

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All Faculty Departments
Department offering the course:	Pharmacognosy and Medicinal plants
Academic year:	2014/2015
Approval Date:	September 2014

A. Basic Information

Course Title: Phytochemistry-I **Course Code: PHG 221**
Prerequisites: Pharmacognosy 2 (PHG212)
Pharmaceutical Organic Chemistry 3 (PHC 213)
Students' Level/Semester: Second Level/ Forth Semester
Credit hours: 4 (3+1)
Actual teaching hours per week:
Lectures: 3/week **Practical:** 2/week **Tutorial:** N/A **Total:**5/week

B. Professional Information

1. Overall Aim of Course

After completion of the course, the students should have both the knowledge and skills that enable them to understand, describe and deal with the chemistry of volatile oils, bitter principles and carbohydrates of both plant and animal origin. The course also offers the primary and advanced methods of chromatography that are currently used for isolation, as well as, qualitative and quantitative determination of biologically active compounds.

2. Intended Learning Outcomes (ILOs)

By the end of the course, the student should be able to

a- Knowledge and Understanding:

a1. Define different classes of biologically active compounds of natural origin.
a2. Identify the chemical structure, physico-chemical properties, identification and uses of volatile oils.
a3. Describe the chemical structure, physico-chemical properties, identification and uses of resins.
a4. Recognize the chemical structure, physico-chemical properties, identification and uses of carbohydrates.
a5. Outline identification and analysis of active constituents of medicinal plants by chromatographic methods.
a6. Determine therapeutic uses, side effects, interactions of medicines and their significance

b- Intellectual Skills:

b1. Categorize the different types of secondary metabolites.
b2. Predict suitable methods for extraction and isolation.
b3. Propose new analytical methods.
b4. Relate different course components to each other.

c- Professional and Practical Skills:

c1. Apply basic methods of analysis of volatile oils.
c2. Use basic laboratory equipment safely and efficiently.
c3. Illustrate basic methods of extraction, and purification of natural compounds.
c4. Indicate basic methods of isolation, and identification of natural compounds.

d- General and Transferable Skills:

d1. Apply critical thinking.
d2. Solve arising problems.
d3. Integrate between different fields of knowledge.
d4. Apply self- learning.

3. Contents

Week	Topic	No. of Hours	Lecture	Practical
One	Introduction of volatile oil & methods of preparation.	**5**	**3**	
	Determination of eugenol in oil of clove.			**2**
Two	Physical properties &chemistry of volatile Oils. Classification of volatile oils.	**5**	**3**	
	Determination of cineole in oil of eucalyptus			**2**
Three	Hydrocarbon volatile oils; structure, properties & uses	**5**	**3**	
	Determination of benzaldehyde in oil of bitter almond and carvone in oil of caraway. Paper chromatography, determination of chemical characters of carbohydrates, monosaccharides.			**2**

Four (1st Midterm Exam)	Alcohol volatile oils, properties, uses & tests.	**5**	**3**	
	Practical Exam-1			**2**
Five	Bicyclic monoterpene alcohols, Properties, uses, tests, characters of carbohydrates, disaccharides.	**5**	**3**	
	Identification of carbohydrates Glucose, fructose, sucrose, lactose, maltose**.**			**2**
Six	Sesquiterpene alcohols: properties & uses; Ketone & Aldehyde Volatile Oils; Properties & Uses; Esters of Aliphatic acids, compounds containing S & N. HPLC, ion exchange & affinity chromatography.	**5**	**3**	
	Identification of gum acacia, tragacanth , agar & starch			**2**
Seven	Polysaccharides 'cont.', Chromatography-1	**5**	**3**	
	Presentation			**2**
Eight	**2nd Mid-term Exam**			
Nine	Electrophoresis	**5**	**3**	
				2
	Chromatography-1			
Ten	Gas chromatography	**5**	**3**	
	Chromatography-2			**2**
Eleven	1. Applications of chromatography	**5**	**3**	
	Revision			**2**
Twelve	2. Applications of chromatography	**5**	**3**	
	Practical exam-2			**2**
Thirteen	Revision	**3**	**3**	**-**
Total No. of hours		**58**	**36**	**22**
Fourteen	**Final Exams of Faculty**			
Fifteen				
Sixteen				

4. Teaching and Learning Methods

4.1. Lectures.

4.2 Practical labs

4.3 Discussions in lectures and labs.

4.4 Presentation and projects.

4. Student Assessment Methods

5.1. Written exam to assess understanding and comprehension.

5.2. Practical exam to assess students' ability to analyze, isolate, qualify and quantify.

5.3. Oral exams to assess communication skills.

5.4. Assignments to assess understanding of the course subjects.

5.5. Oral presentation to assess general and transferable skills.

Assessment Schedule

Assessment 1	1st mid-term exam	Week 4
Assessment 2	2nd mid-term exam	Week 8
Assessment 3	Practical exam-1	Week 4
Assessment 4	Practical exam-2	Week 12
Assessment 5	Final exam	Week 15/16
Assessment 6	Oral exam	Week 15/16
Assessment 7	Semester Work (Assignments +Oral presentation)	During the semester

Weighing of Assessment

1st mid-term exam	5 %
2nd mid-term exam	15 %
Practical exam	30 %
Final-term exam	30 %
Oral exam	10 %
Semester work	10 %
Assignments	5%
Oral Presentation	5%
Total	**100 %**

5. List of References

6.1. Course Notes

i. Handouts are given to students

ii. Lab manual

6.2. Essential Books (Text Books)

- Evans, W. C., Trease and Evans Pharmacognosy, Edinburgh, London, New York, Oxford, Philadelphia, St. Louis and Toronto: 16th. Ed. Elsevier, 2010.

6.3. Recommended Books

- Bruneton, J.: "Pharmacognosy Phytochemistry Medicinal Plants", Lavoisier publishing, (1999).
- Egyptian Pharmacopoeia, English Text, (4th Ed.), Egyptian Government, http://www.egypt.gov.eg/arabic/default.asp 2005.
- Balbaa, S.I., S.H. Hilal and A.Y. Zaki. Medicinal Plant Constituents. 2nd ed. Egypt: Central Cairo, Agency for University and Schoolbooks. 1978.
- Connoly, Z.D. and R.A. Dictionary of Terpenoids Vols 1-3. London: Chapman and Hall, 1991
- The Merck Index, An Encyclopedia of chemicals, Drugs and Biologicals. 11th ed., USA: Merck and Co., Inc., Rahway, N.I., 1989.
- Robbers, J. E., M. K. Speedie and V.E. Tyler Pharmacognosy and Pharmacobiotechnology. Baltimore, London, Paris: Williams and Wilkins, 1996.

6.4. Periodicals, Websites, ……etc

Journals {phytochemistry, chromatography, pharmazia}…
Pubmed.com library

7. Facilities Required for Teaching and Learning

Computers and data shows, white boards and markers. Labs and electric water baths, glass wares, Clevenger`s apparatus, hot plate, chromatographic jars and chemicals.

Course Coordinator

Prof. Mariam Gonaid

Head of Department

Prof. Miriam Yousif

Department Approval Date: September 2014

FUTURE UNIVERSITY IN EGYPT
FACULTY OF PHARMACEUTICAL SCIENCES AND PHARMACEUTICAL INDUSTRIES

Course Specifications

Phytochemistry-II (PHG 322)

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All Faculty Departments
Department offering the course:	Pharmacognosy and Medicinal plants
Academic year:	2014/2015
Approval Date:	September 2014

A. Basic Information

Course Title: Phytochemistry-II **Course Code: PHG 322**

Prerequisites: Pharmacognosy 2 (PHG 212)
Pharmaceutical Organic chemistry 3 (PHC 213)

Students' Level/Semester: Third Level/ Fifth Semester

Credit hours: 4 **4 (3+1)**

Actual teaching hours per week:

Lectures: 3/week **Practical:** 2/week **Tutorial:** N/A **Total:** 5/week

B. Professional Information

1. Overall Aim of Course

After completion of the course, the students should have both the knowledge and skills that enable them to understand, describe and deal with the chemistry of alkaloids, glycosides, bitter principles and tannins of plant or animal origin and the related techniques.

2. Intended Learning Outcomes (ILOs)

a- Knowledge and Understanding:

a1. Define different classes of biologically active compounds of alkaloids of natural origin and their distribution in nature.

a2. Describe the chemical structure, physico-chemical properties, identification, and uses of alkaloids.

a3. Illustrate the different chemical methods used to prepare, isolate and analyze the biologically active alkaloids with brief description of their medicinal uses.

a4. Recognize different classes of biologically active compounds of glycosides of natural origin and their distribution in nature.

a5. Identify the chemical structure, physico-chemical properties, identification, and uses of glycosides and tannins.

a6. Select the different chemical methods used to prepare, isolate and analyze the biologically active glycosides and tannins with brief description of their medicinal uses.

a7. Recognize changes in structure that modify biological activities.

b- Intellectual Skills:

b1. Categorize the different types of biologically active secondary metabolites.

b2. Predict suitable methods for extraction of different compounds.

b3. Distinguish suitable methods for isolation of different compounds

b4. Determine therapeutic uses, side effects, interactions of medicines and their significance.

b5. Relate between different course components structure, chemical identification and separation of certain chemical groups of plant constituents.

b6. Conclude effective solutions for problems involving reasonable complex mixtures.

b7. Evaluate situations wisely.

b8. Judge problems independently.

c- Professional and Practical Skills:

c1. Apply basic methods of extraction, isolation, purification and identification of natural compounds.

c2. Use basic laboratory equipment safely and efficiently.

c3. Analyze natural compounds quantitatively

d- General and Transferable Skills:

d1. Work effectively as part of a team to produce reports and presentations.

d2. Explain solutions for arising problems.

d3. Set realistic targets.

d4. Plan work and time to meet targets within deadlines.

d5. Integrate different fields of knowledge.

3. Contents

Teaching Weeks	Topic	No. of hours	Lecture	Practical
One	Introduction of Alkaloids Introduction of Phenolic Glycosides	5	3	
	Phytochemical Screening,			2
Two	Introduction of Alkaloids, (cont.) Physical & Chemical Properties Glycoside; Hydrolysis, Distribution, Extraction Isolation &	5	3	

	Purification			
	Phytochemical Screening (cont.)			2
Three	Examples of Alkaloids of Phenyl Alkyl-Amine group; Structure, Isolation & Identification Pharmacological Activity Structure Classification Simple Phenolic Glycosides; Occurrences, Isolation & Identification	5	3	
	Phytochemical Screening			2
Four	Examples of Alkaloids of Pyridine Piperine & Pyridone group; Structure, Isolation & Identification. Antharacene Glycosides; Occurrences, Types Structures Isolation & Identification + **First Midterm Exam**	5	3	
	Revision			2
Five	Examples of Alkaloids of Tropane group; Structure, Isolation & Identification Flavonoid Glycosides; Occurrences, Types Structures Isolation & Identification, *(cont.)*	5	3	
	Determination of total Alkaloids in *Hyoscyamus muticus* "Egyptian Henbane"			2
Six	Examples of Alkaloids of Quionoline & Isoquionoline group; Structure, Isolation & Identification. Flavone Glycosides; Occurrence, Structures, Isolation & Identification	5	3	
	1st Practical Exam			2
Seven	Examples of Alkaloids of Phenanthene group; Structure, Isolation & Identification. Flavnone Glycosides; Occurrence,	5	3	

	Types Structures Isolation & Identification			
	Identification of Eserine, Ephedrine, Quinine Alkaloids by different chemical Tests			2
Eight				
	Second Midterm exam			
Nine	Examples of Alkaloids of Indole group; Structure, Isolation & Identification Isoflavonoid & Anthrocyanidin Glycosides; Occurrences, Types Structures Isolation & Identification.	5	3	
	Identification of Caffeine, Strychnine, & Brucine Alkaloids by different chemical Tests			2
Ten	Examples of Alkaloids of Carboline group; Structure, Isolation & Identification Coumarin Glycosides; Occurrences, Types Structures Isolation & Identification	5	3	
	Identification of Pilocarpine, Papaverine & Atropine Alkaloids			2
Eleven	Examples of Alkaloids of Imidazole & Purine group; Structure, Isolation & Identification Steroidal Cardio-Active Glycosides Occurrences, Types Structures Isolation & Identification	5	3	
	Revision			2
Twelve	Examples of Alkaloids of Steroidal group; Structure, Isolation & Identification Cyanophoric & Thioglycosides; Occurrences, Types Structures Isolation & Identification	5	3	
	2nd Practical Exam			2
Thirteen	Revision Tannins; Occurrences, Types &	3	3	

	Identification			
Total No. of hours		58	36	22
Fourteen	**Final Exams of Faculty**			
Fifteen				
Sixteen				

4. Teaching and Learning Methods

4.1. Modified lectures.

4.2. Practical labs.

4.3. Discussions in lectures and labs

5. Student Assessment Methods

5.1. Written exam to assess understanding and comprehension.

5.2. Practical exam to assess students ability to analyze, isolate, qualify and quantify

5.3. Oral exams to assess communication skills

5.4. Semester Work (Participation + Project) to assess all types of skills.

Assessment Schedule

Assessment 1	1st midterm exam	Week 4
Assessment 2	2nd midterm exam	Week 8
Assessment 3	practical exam-1	Week 6
Assessment 4	practical exam-2	Week 12
Assessment 5	Final exam	Week 15/16
Assessment 6	Oral exam	Week 15/16
Assessment 7	Semester Work (Participation + Project)	During the semester

Weighing of Assessments

Mid-Term Examination	20%
Final-Term Examination	30%
Oral Examination	10%
Practical Examination	30%

- Unknown alkaloid (15%)
- Phytochemical screening (15%)

Semester Work 10%

- Participation (5%)
- Project (5%)

Total 100 %

6. List of References

6.1. Course Notes

i. Handouts are given to students
ii. Lab manual

6.2. Essential Books (Text Books)

Evans, W. C., Trease and Evans Pharmacognosy, Edinburgh, London, New York, Oxford, Philadelphia, St. Louis and Toronto: 16th. Ed. Elsevier, 2010.

6.3. Recommended Books

- Egyptian Pharmacopoeia, English Text (2005), (4th Ed.), Egyptian Government, http://www.egypt.gov.eg/arabic/default.asp
- Bruneton, J.: "Pharmacognosy Phytochemistry Medicinal Plants", Lavoisier publishing, (1999).
- Balbaa, S.I., S.H. Hilal and A.Y. Zaki. Medicinal Plant Constituents. 2nd ed. Egypt: Central Cairo, Agency for University and Schoolbooks. 1978.
- Connoly, Z.D. and R.A. Dictionary of Terpenoids Vols 1-3. London: Chapman and Hall, 1991
- The Merck Index, An Encyclopedia of chemicals, Drugs and Biologicals. 11th ed., USA: Merck and Co., Inc., Rahway, N.I., 1989.
- Robbers, J. E., M. K. Speedie and V.E. Tyler Pharmacognosy and Pharmacobiotechnology. Baltimore, London, Paris: Williams and Wilkins, 1996.

6.4. Periodicals, Websites, ……etc

Journals {phytochemistry, chromatography, pharmazia}…
Pubmed.com library

7. Facilities Required for Teaching and Learning

Computers and data shows, white boards and markers. Labs and electric water baths, glass wares, Clevenger`s apparatus, hot plate, chromatographic jars and chemicals

Course Coordinator
Prof. Osama Salama

Head of Department
Prof. Miriam F. Yousif

Department Approval Date: September 2014

FUTURE UNIVERSITY IN EGYPT
FACULTY OF PHARMACEUTICAL SCIENCES AND PHARMACEUTICAL INDUSTRIES

Course Specifications

Herbal Medicine (PHG 331)

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All Faculty Departments
Department offering the course:	Pharmacognosy and Medicinal Plants
Academic year:	2014/2015
Approval Date:	September 2014

A. Basic Information

Course Title: Herbal Medicine **Course Code: PHG 331**

Prerequisite: Phytochemistry (2), PHG 322

Students'Level/Semester: Third Level/ Sixth Semester

Credit Hours: **2 (2+0)**

Actual teaching hours per week:

Lectures: 2/week **Practical:** N/A **Tutorial:** N/A **Total:** 2/week

B. Professional Information

1. Overall Aim of Course

Upon completion of the course, the student should have knowledge and skills that enable him/her to understand and deal with herbal remedies regarding their active constituents, mechanism of action, medical application, dose and dosage forms, quality control procedures required for the assurance of the herbal preparations or extracts, contra-indications and side effects. He should also have the knowledge and skills that enable her/him to use herbal medicine as a type of alternative and/or complementary medicine for treatment of the diseases of different organs. He should be able to prescribe herbal remedies for most of the diagnosed diseases.

2. Intended Learning Outcomes (ILOs)

By the end of the course, the student should be able to:-

a- Knowledge and Understanding:

a1. Memorize the history of herbal drugs.
a2. Describe the advances in herbal drugs.
a3. Classify different mechanisms of action of natural products.
a4. Discuss the action of these mechanisms on the human system
a5. Choose the best mechanisms acting on the human system.
a6. Identify the associated risks produced by natural products on human system.
a7. Define the concepts of manufacturing natural products.

b- Intellectual Skills:

b1. Design an herbal preparation for treatment or prevention of an ailment.
b2. Predict drug–herb or food–herb interactions.
b3. Illustrate methods of avoiding these interactions.
b4. Evaluate herbal preparations used in certain health problems

c- Professional and Practical Skills

c1. Describe information as specialist for herbal medicine.
c2. Select useful and safe herbal drugs for certain cases.
c3. Formulate a nutritional supplement for a certain health problem

d- General and Transferable Skills

d1. Use different resources to obtain information.
d2. Support Team work.
d3. Apply gained knowledge and skills in independent learning.
d4. Design a plan for a person who wants to use a herbal or a nutraceutical preparation

3. Contents

Week	Topic	No. of hours	Lecture
One	-Introduction to herbal medicine -Definitions & Terminology.	**2**	**2**
Two	Requirements for the preparation of Medicinal Plant products from a plant. -Complexity of herbal medicines and possibility of interaction between plant constituents	**2**	**2**
Three	Plants and the digestive system:- Stomatitis, Gingivitis & Glossitis, Gastritis and peptic ulcers	**2**	**2**
Four	- **(1st Midterm Exam)** Plants and the digestive system: -Dyspepsia -Flatulence- Constipation- Diarrhea	**2**	**2**
Five	Plants and the respiratory system: -Bronchial asthma-Bronchitis-Cough	**2**	**2**
Six	Plants and the renal system-Infections of urinary tract and the	**2**	**2**

	use of diuretics and urinary antiseptics		
Seven	Plants and renal system "Cont"	**2**	**2**
Eight	**2nd Midterm Exam**		
Nine	Plants and skin and cutaneous system: inflammatory skin diseases	**2**	**2**
Ten	Eczema ,Acne ,wounds, Psoriasis & skin	**2**	**2**
Eleven	Drug food interactions, Drug herb interactions. **Receiving Posters**	**2**	**2**
Twelve	**Poster Presentation**	**2**	**2**
Thirteen	Revision	**2**	**2**
Total No. of Hours		**24**	**24**
Fourteen	University Electives Final exam		
Fifteen	Final exam		
Sixteen	Final exam		

4. **Teaching and Learning Methods**
   - **4.1.** Lectures
   - **4.2.** Assignments & presentations
   - **4.3.** Discussion
5. **Student Assessment Methods**
   - **5.1.** Written exams to assess knowledge and understanding, as well as, intellectual and professional skills
   - **5.2.** Assignments and presentations to assess general and transferable skills.
   - **5.3.** Poster presentation to assess general and transferrable skills.
   - **5.4.** Participation to assess all types of skills.

Assessment Schedule

Assessment 1 1st Midterm Exam Week 4
Assessment 2 2nd Midterm Exam Week 8

Assessment 3	Final exam	Week 15/16
Assessment 4	Oral Presentation	Week 11
Assessment 5	Participation	During the semester

Weighing of Assessments

1st Midterm Exam	10 %
2nd Midterm Exam	20 %
Final-Term Examination	40 %
Semester Work	30 %
Poster presentation	20%
Attendance & Participation	10%
Total	**100 %**

6. List of References

6.1. Course notes

- Handouts part by part

6.2. Essential Books (Text Books)

- Heinrich, M., Barnes, J. Gibbons S., and E. M. Williamson (ed): Fundamentals of Pharmacognosy and Phytotherapy, (2nd Ed), Elsevier, 2012.
- Bone, K., Mills, S.: Principles and Practice of Phytotherapy: Modern Herbal Medicine, (2nd Ed), Edinburgh, London, New York, Oxford, Philadelphia, St. Louis and Toronto, Churchill Livingstone Elsevier Ltd. 2013.
- Evans, W. C., Trease and Evans Pharmacognosy, (16th ed), Edinburgh, London, New York, Oxford, Philadelphia, St. Louis and Toronto, Elsevier, 2010.
- Capasso, F., Gaginelia, T.S., Grandolini, G., Izzo, A. A., Phytotherapy- A Quick reference to herbal medicine, Spring-Verlag, Berlin, Heidelberg, New York, 2003.

6.3. Recommended Books

- Pizzorno J. E. and Murray, M.T., Textbook of Natural Medicine, Churchill Livingstone Elsevier Inc., (4th ed), 2013.

6.4. Periodicals, Websites, ……etc

Fitoterapia, J. of ethnopharmacology

7. Facilities Required for Teaching and Learning

Computers and video projector, white boards and markers.

Course Specifications

Course Coordinator
Mohammad L. Ashour
Head of Department
Miriam F. Yousif

Department approval Date: Sept. 2014

FUTURE UNIVERSITY IN EGYPT
FACULTY OF PHARMACEUTICAL SCIENCES AND PHARMACEUTICAL INDUSTRIES

Course Specifications

Herbal Medicine Production (PHG 632)

Program (s) on which the course is given:	Bachelor of Pharmaceutical Sciences and Pharmaceutical Industries
Department offering the program:	All Faculty Departments
Department offering the course:	Department of Pharmacognosy and Medicinal Plants
Academic year:	2014/2015
Approval Date:	September 2014

A. Basic Information

Course Title: Herbal Medicine Production **Course Code:** PHG 632
Prerequisites: Pharmacognosy 1 (PHG 111) & Pharmacognosy 2 (PHG 212)
Students' Level/Semester: Faculty Elective
Credit hours: 2 (2+0)
Actual teaching hours per week:
Lectures: 2/week **Practical:** N/A **Tutorial:** N/A **Total:** 2/week

B. Professional Information

1. **Overall Aim of Course**

Students are supposed to have an overview of the steps of commercial production of medicinal plants to the market. Upon successful completion of this course, the students will be able to demonstrate knowledge in different factors that affect the production of medicinal plants and their constituents such as methods of cultivation, effect of ecology, soil and plant hormones on their growth, methods of collection, drying and storage in addition to different methods of preparation of plant extracts and galencials. The course provides students with knowledge and skills concerning the modern methods for production of active constituents of natural sources by tissue culture and precautions to be taken for the optimum yield, as well as, the marine plants and their medicinal potentiality.

2. **Intended Learning Outcomes (ILOs)**

By the end of the course, the student should be able to:

a- Knowledge and Understanding:

a1. Outline role of medicinal plants in national economy.
a2. Recognize worldwide trade of medicinal and derived products.
a3. State utilization of aromatic plants in cosmetics and aromatherapy.
a4. Identify herbs as health food.
a5. Explain different methods for production of medicinal plants, products and factors affecting it.
a6. Summarize plant-based drug industry.
a7. Discuss plant cell and tissue culture technology.

a8. List novel potent drugs from marine source.

b- Intellectual Skills:

b1. Design a plan for a person who wants to use an herb or a nutraceutical preparation.

b2. Categorize different types of biologically active herbal products derived from marine plants.

b3. Evaluate independently.

b4. Judge independently.

c- Professional and Practical Skills:

c1. Formulate a nutritional supplement for a certain health problem.

c2. Apply tissue culture as a different technique for production of natural products.

d- General and Transferable Skills:

d1. Work effectively as part of a team to produce reports and presentations.

d2. Plan work and time to meet targets within deadlines.

d3. Integrate different fields of knowledge.

d4. Select useful and safe herbal drugs for certain cases

d5. Predict the most suitable herbal supplement for certain health problem.

3. Contents

Teaching Weeks	Topic	No. of hours	Lecture
One	Introduction, economic growth potential in natural health, development of herbal medicine, future economic growth.	**2**	**2**
Two	Demand of herbal medicine, major importing and exporting medicinal plants: liquorice, bran, ginseng, etc….	**2**	**2**
Three	Different factors that affect the production of medicinal plants and their constituents: methods of cultivation, effect of ecology, and plant hormones on their growth, methods of collection, drying and storage	**2**	**2**

Four	Important aromatic medicinal plants + **First Midterm Exam**	**2**	**2**
Five	Important aromatic medicinal plants (cont.):	**2**	**2**
Six	OTC drugs of plant origin, extracts and galenicals, essential oils, phytopharmaceuticals and herbal cosmetics, personal care products.	**2**	**2**
Seven	Plant tissue culture as advanced method for production of active constituents: advantages, different techniques.	**2**	**2**
Eight	**Second Midterm exam**		
Nine	Plant tissue culture (cont.): basic requirements, industrial production of different active constituents	**2**	**2**
Ten	Marine organisms as potential source of drugs, examples of marine natural products: anti-microbial, anti-viral	**2**	**2**
Eleven	Marine organisms (cont.): cytotoxic, cardiovascular, anti-inflammatory, anthelmintic, anti-coagulant, prostaglandins.	**2**	**2**
Twelve	Herbs as health food: introduction, nutraceuticals, antioxidants, prebiotics, probiotics, PUFA, dietary fibers, carotenoids.	**2**	**2**
Thirteen	**Revision**	**2**	**2**
Total No. of hours		**24**	**24**
Fourteen	**University Elective Final Exams**		
Fifteen	**Final Exams**		
Sixteen			

4. Teaching and Learning Methods

4.1. Lectures.
4.2. Presentation.
4.3. Discussions in lectures.
4.4. Field visits to herbal products factories.

5. Student Assessment Methods

5.1. Written exams to assess understanding and comprehension as well as intellectual and professional skills.
5.2. Presentation to assess transferable skills.
5.3. Semester Work (Participation) to assess all types of skills.

Assessment Schedule

Assessment 1 First Mid-Term Examination	Week 4
Assessment 2 Second Mid-Term Examination	Week 8
Assessment 3 Final-Term Examination	Week 15
Assessment 4 Semester Work (Participation)	During the Semester
Assessment 5 Presentation	During the semester

Weighing of Assessments

First Mid-Term Examination	10 %
Second Mid-Term Examination	25 %
Final-Term Examination	50 %
Semester Work + Presentation	15 %
Total	100 **%**

6. List of References

6.1 **Course Notes:**

Staff lectures handouts given to students and/or uploaded to the Moodle

6.2 **Essential Books (Text Books)**

Kalia A.N. (2011): Textbook of Industrial Pharmacognosy . CBS Publisher & Distributors P Ltd.

6.3 **Recommended Books**

- Egyptian Pharmacopoeia, English Text (2005), (4th Ed.), Egyptian Government, http://www.egypt.gov.eg/arabic/default.asp
- Blumenthal, M (ed). : "Herbal Medicine- Expanded Comission E Monographs", Integrative Medicine Communications, USA (2000).
- Capasso, F., Gaginelia, T.S., Grandolini, G., Izzo, A. A., Phytotherapy- A Quick reference to herbal medicine, Elsevier, 2002.

- Pizzorno J. E. and Murray, M.T., Textbook of Natural Medicine, Churchill Livingstone, 3rd ed, 2006.
- Bruneton, J.: "Pharmacognosy Phytochemistry Medicinal Plants", Lavoisier publishing, (1999).

6.4 **Periodicals, Websites, ……etc**

- http://www.bestnetcraft.com/spicy_recipes.pdf
- www.who.int/**medicine**docs/pdf/.../whozip57e.pdf
- http://www.herbdatanz.com/index.htm
- lib.icimod.org/record/9506/files/5191.pdf;
- www.ncbi.nlm.nih.gov/pubmed/
- http://www.who.int/medicines/library/trm/medicinalplants.pdf

7 Facilities Required for Teaching and Learning

- Whiteboard, screen, computer equipped with video projector.

Course Coordinator

Head of Department

Prof. Miriam F. Yousif

Department Approval Date: September 2014