Zagazig University

Faculty of Pharmacy

Microbiology Department

Program and Course Specifications

Master and Ph.D.

Degrees

2012/2013

Master Degree

Program Specification

Program Specification

A- Basic Information

1- Program title: M.Pharm. Sci Degree in **Microbiology**

2- Program type: Monodisciplinary.

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

4- Department: Microbiology

5- Coordinator: Prof. Dr. Fathy Serry

6- Date of program specification approval: 2012

B- Professional Information

1- Program aims:

The Microbiology master's program aims to provide the postgraduate master students with a Special and advanced education in the field of pharmaceutical microbiology, medical microbiology, and microbial biotechnology and related disciplines in microbiology, enable the students to gain the skills and attitudes required for the responsible practice in pharmaceutical industry, research institutions, medical microbiology laboratory, in public health, the food industry or water authorities and qualify the students for further higher degree studies.

2-Intended Learning Outcomes (ILOs):

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

2-1- Knowledge and Understanding :

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

A.1- Express properly the theories and principles of microbiology and their related subjects including molecular biology, biotechnology, clinical microbiology and pharmaceutical microbiology.

A.2-Outline the influence of microbiology branches on the environment.

A.3- Illustrate the developments in the field of biotechnology and genetics and their applications.

A.4- Understand the moral and legal principles for professional practices in microbiology.

A.5-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.

A.6- Demonstrate full awareness of ethics in all aspects of scientific research.

2-2 - Intellectual Skills:

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

B.1- Analyze and interpret data obtained from microbiology research in a specific and suitable form.

B.2- Suggest significant solutions for problems discovered in microbiological results based on a wide academic background.

B.3- Acquire the needed pharmaceutical knowledge to manage professional problems in microbiological researches.

B.4- Conduct research and write scientific reports on the obtained results of research.

B.5-Recognize possible hazards during work and how to deal with them effectively.

B.6- Design an effective laboratory protocol for the research to improve the performance.

B.7- Take professional decisions in different issues during research.

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- Understand the basic and recent laboratory techniques in microbiological research.

C.2- Write professional scientific reports in microbiological research and evaluate them.

C.3- Conduct various methods and microbiological techniques of analysis and assure the quality and suitability of instruments.

2-4 - General and Transferable Skills:

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

D.1- Interact effectively with patients and microbiology professionals.

D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.

D.3- Practice self assessment of learning needs in the field of microbiology.

D.4- Retrieve information from various sources in the field of microbiology.

D.5- Set criteria for evaluating others performance in the field of microbiology and its different branches.

D.6- Work effectively as a member of team.

D.7- Get maximum use of time to achieve goals.

D.8- Study independently for continuous self learning and plan research studies.

3- Academic Standards:

- NARS (National Academic Reference Standards)

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

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- Express properly the theories and principles of microbiology and their related subjects including molecular biology, biotechnology, clinical microbiology and pharmaceutical microbiology.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2-Outline the influence of microbiology branches on the environment
	2.1.3- Scientific developments in the area of specialization.	A.3- Illustrate the developments in the field of biotechnology and genetics and their applications

	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.4- Understand the moral and legal principles for professional practices in microbiology.
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.
	2.1.6- The fundamentals and ethics of scientific research.	A.6- Demonstrate full awareness of ethics in all aspects of scientific research.
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from microbiology research in a specific and suitable form.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Suggest significant solutions for problems discovered in microbiological results based on a wide academic background.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Acquire the needed pharmaceutical knowledge to manage professional problems in microbiological researches.

	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research and write scientific reports on the obtained results of research.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Recognize possible hazards during work and how to deal with them effectively.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Design an effective laboratory protocol for the research to improve the performance.
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in different issues during research.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Understand the basic and recent laboratory techniques in microbiological research.
	2.3.2- Write and evaluate professional reports.	C.2- Write professional scientific reports in microbiological research and evaluate them.
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Conduct various methods and microbiological techniques of analysis and assure the quality and suitability of instruments.
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Interact effectively with patients and microbiology professionals.

	2.4.2- Effectively use information technology in professional practices	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
	2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment of learning needs in the field of microbiology.
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of microbiology.
	2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Set criteria for evaluating others performance in the field of microbiology and its different branches.
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team.
	2.4.7- Manage time effectively.	D.7- Get maximum use of time to achieve goals.
	2.4.8- Continuous and self learning.	D.8- Study independently for continuous self learning and plan research studies.

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:

Course Code	Course Title	Credit hours	Program ILOs Covered
	General Courses:		
M110	1- Molecular Biology	4	A1, A2, A3, B3,D2, D4,D8
M112	2- Physiology	2	A1, A2, B3, D1

M111	3- Biostatistics	2	A1, A2, A3, B1, B6, D2
M102	4- Instrumental analysis	4	A1, A2, B2, B3, D2, D5, D6
ME4	5- Elective A Biotechnology	4	A1, A2, A3, B3 D2, D4,D6, D8
ME5 ME7	6- Elective B Applied Pharmacology Drug induced diseases	4 4	A1, A2, B3, B7, D3 A1, A2, B2, B3, D4
	Special Courses:		
Isp1	Advanced Microbial Biotechnology	4	A1, A2, A3, B1, D2, D4, D6, D8
Isp2	Advanced Pharmaceutical Microbiology	4	A1, A2, A3, A5, B1, D2, D4, D6, D8
Isp3	Clinical Microbiology	4	A1, A2, B1, D2, D4, D6, D8
	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

Evaluator	Method	Sample
Internal evaluator: Professor Dr. Fathy Serry	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Assistant Professor. Ramadan El-Domany	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator **Head of Department**

Prof. Dr. Fathy Serry **Prof. Dr. Hemmat Kamal**

Courses offered by other departments

Molecular Biology

Course specification of Molecular Biology

Course Specification:

- Program on which the course is given: Master degree of pharmaceutical science.
- Major or minor Element of program: Major
- Department offering the program : Microbiology and Immunology
- Department offering the course: Biochemistry department in conjunction with Microbiology department
- Date of specification approval: 2012/2013

1-Basic information:

Title: Molecular biology Code: M110

Lectures: 4 hrs/ week Credit hrs: 4 hrs

Total: 4 hrs/week

2-Overall aim of the course:

On completion of the course, the students will be able to outline principle information on DNA and RNA and illustrate the basis of genetic engineering and its applications.

3- Intended learning outcomes (ILOs) of Molecular biology

A-Knowledge and Understanding	
a1	Outline principles of DNA structure, synthesis and sequencing.
a2	Illustrate RNA functions , protein synthesis and separation process.
a3	Summarize basis of genetic engineering , DNA cloning and PCR techniques.
a4	Identify the applications of genetic engineering in diagnosis and treatment of genetic diseases.
B-Intellectual skills	
b1	Apply molecular biology background to solve professional problems
D- General and transferable skills	
d1	Use computer skills as internet and power point in the activities.
d2	Gain information from various sources as text books, scientific journals, internet……..
d3	Search on various topics and write reports.

4- Course Content of Molecular Biology

Week number	Lecture contents (4hrs/week)
1	• DNA ,RNA structure, function. • Difference between DNA and RNA
2	• DNA replication steps
3	• Types of RNA • Genetic code
4	• Protein synthesis • Alteration of nucleotide sequence
5	• Genetic engineering • DNA cloning • Applications of cloning in treatment of diseases • Activity
6	• Genomic DNA libraries, c DNA • PCR, LCR and their applications
7	• RFLP • Linkage of polymorphism with gene mutation • Prenatal diagnosis, Diagnosis of sickle cell disease • Case studies
8	• Sequencing of DNA (chemical method)
9	• Sequencing of DNA (enzymatic method)
10	• Electrophoresis
11	• Sothern, western and northern blotting
12	• Sequencing of proteins
13	• Synthesis of genes

14	• Monoclonal antibodies + activity (reports)
15	• Revision and open discussion

5- Teaching and learning methods:

- Lectures
- Self learning
- Open discussion and presentations

6- Student assessment methods:

Written exam assess: a1, a2, a3, a4

Oral exam assess: a1, a2, a3, a4, b1, d3

Activity assess: d1, d2, d3

Assessment schedule:

Assessment (1): Activity	Week 4-15
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 %
TOTAL	**100**	**100%**

7- References and books:

A- Scientific papers

B- Essential books: Lippencott's biochemistry

Brown, T.A. (1991). Essential Molecular Biology - A Practical approach. Vol-I, Vol - n , Oxford Univ. Press. Oxford.

David, J., Ulley and Eckstein, F. (1992). Nucleic Acids and Molecular Biology. Vol-6, Springer-verlag Berlin Heidelberg.

Desmond, S.T., and Nicholl. (1994). An Introduction to genetic Engineering Cambridge Univ. Press. Cambridge.

Freifelder, D. (1990). Microbial genetics. Narosa Pub. Home. India.

Gardner, E.J. (1991). Principles of Genetcis. John Wiley and Sons Inc. NY.

Old, R.W. and Primrose, S.B. (1989).Principles of Gene Manipulation. 4th Edn. Black Well Scientific Pub. London.

Watson, J.D., Hopkins, N.H., Roberts, J.W.. Steitz, J.A- and Weiner, A.M. (1987). Molecular biology of the gene. 4th Edn. The Benjanun/cummmgs Publishing Company Inc. NY.

Pollard ,Thomas D.and ; William C. Earnshaw (2004) .Cell Biology . Philadelphia: Saunders.

Lodish, Harvey, Arnold Berk, S. Lawrence Zipursky, Paul Matsudaira, David Baltimore, James Darnell Molecular Cell Biology, 4th ed (2000), New York

C- Suggested books: Molecular cell biology, Lodish

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Mohamed Mahmoud El-Seweidy and Prof. Dr. Fathy serry**
- **Head of Department: Prof Dr/ Mervat Asker**
- **Date: 2012-9-2 تم اعتماده فى مجلس القسم بتاريخ**

Biotechnology

Course specification of 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: Microbiology and Immunology
- Department offering the course: Biochemistry department in conjunction with Microbiology department.
- Date of specification approval: 2012/2013

1- Basic information:

Title: Biotechnology Code: ME4

Lectures: 4 hrs/week Credit hours: 4 hrs

Total: 4 hrs/week

2-Overall aim of the course:

- On completion of the course, the students will be able to illustrate principles of biotechnology and cell culture, outline recent medical biotechnology applications and apply biotechnology and genetic engineering in developing and improving drugs, vaccines other useful compounds.

3. Intended learning outcome s (ILOs) of biotechnology:	
A- Knowledge and Understanding	
a1	Understand the principles of biotechnology techniques
a2	Understand how to manage and exploit knowledge of DNA cloning, recombinant DNA, and applied technology.
a3	Summarize recent medical biotechnology applications.
B- Intellectual skills	
b1	Apply biotechnology in medicine, agriculture and pollution control.
D- General and transferable skills	
d1	Use computer skills as internet and power point in the activities.
d2	Gain information from various sources as text books, scientific journals, internet……..
d3	Search on various topics and write reports.

4- Course Content of ygolonhcetoiB

Week number	Lecture contents (4hrs/week)
1	• Introduction to biotechnology
2	• Bioprocess
3	• Downstream processing
4	

	• Cell culture • Activity (reports)
5	• Hybridoma technology
6	• Medical biotechnology
7	• Medicine from cultured cells
8	DNA Recombination & Application of genetic engineering
9	• Principle of PCR technology and gene amplification.
10	• Applications and advances in PCR
11	• Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of MAbs
12	• Global Marketing Pharmaceutically useful monoclonal antibodies
13	• Applications and advances in PCR
14	• Vaccine preparations • Stem cells technology & • Regenerative medicine. • Activity (presentation of reports)
15	• Revision and open discussion

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion and presentations

6-Student Assessment methods:

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

Oral exam assess: a1, a2, a3, b1, d3

Activity assess: d1, d2, d3

Assessment schedule:

Assessment (1): Activity	Week 4-14
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 %
TOTAL	**100**	**100%**

7- References and books:

A- Scientific papers

B- Essential books: - Biotechnology&pharmacy

1. Crommelin, D.A.; and Sindeler, R.D. (1997). Pharmaceutical Biotechnology. Hartwood Academic Publishers. The Netherlands.

2. Glick, B.P.; and Pasterternak, J.J. (1994). Molecular Biotechnology-Principles Applications of recombinant DNA. AS Press, Washington, D.C., USA.

C- Suggested books: Biotechnology in health care: an introduction to biopharmaceuticals

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Mohamed El-Seweidy and Prof. Dr. Ashraf Ahmed Kadry**
- **Head of Department: Prof Dr/ Mervat Asker**
- **Date: 2012-9-2 تم اعتماده فى مجلس القسم بتاريخ**

Instrumental Analysis II

Course specification of Instrumental Analysis II

A- Course specifications:

- Program on which the course is given: Master's of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Microbiology and Immunology
- Department offering the course: Analytical Chemistry.
- Date of specification approval: 2012/2013

1- Basic information:

Title: Instrumental Analysis II Code: M102
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 outline the basis and applications of instrumental analysis and describe theories, operation, pharmaceutical and biological applications of instrumental techniques.

3. Intended learning outcome s (ILOs):

A- Knowledge and Understanding	
a1	Outline the basis, theory and operation of the different instrumental techniques of analysis.
a2	Describe different pharmaceutical and biological applications of instrumental techniques.
B- Intellectual skills	
b_1	Decide the use of most appropriate instrumental technique in pharmaceutical and biological assay.
b_2	Integrate the knowledge gained by studying different instrumental techniques in designing analytical system for analytes of complex nature
D- General and Transferable skills	
d_1	Acquire Computer skills like preparing presentations and collecting information through different data-bases.
d_2	Work effectively as a member of team
d_3	Improve scientific brain storming capabilities of team members

4. Course Contents:

Week number	Content
1	Introduction Principles
2	**Spectroscopy [**Ultraviolet (UV)‑visible spectrophotometry, Fluorometry] Basis Pharmaceutical and biological applications.
3	**Spectroscopy: [**Infrared (IR) spectroscopy]. Basis Pharmaceutical and biological applications
4	**Spectroscopy: [**Atomic absorption spectroscopy]. Basis Pharmaceutical and biological applications
5	**Nuclear magnetic resonance (NMR).** Basis Pharmaceutical and biological applications
6	**Conductometry, Potentiometry.** Basis Pharmaceutical and biological applications.
7	**Mass‑spectrometry (MS)** Basis Pharmaceutical and biological applications.
8	**Polarography and Voltammetry** Basis Pharmaceutical and biological applications.
9	**Chromatography:** Introduction Classification
10	**Quantitative and Qualitative TLC** Basis Pharmaceutical and biological applications
11	**HPLC** Basis Types
12	**HPLC** Isocratic flow and gradient elution

	Parameters Internal diameter Particle size Pore size Pump pressure
13	**HPLC** Detectors Applications
14	**Gas Chromatography** Basis Pharmaceutical and biological applications
15	**Revision and Open discussion**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, b1, b2
Oral exam to assess: a1, a2, b1 and b2
Activity to assess: d1, d2 and d3

Assessment schedule:

Assessment (1): Activity	Week 8
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 %

TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers

B- Essential books:

1-Modern Analytical Chemistry, David Harvey, McGraw-Hill Companies, first edition, 2002

2-Guidance for Industry: Q2B of Analytical Procedures; Methodololgy: International Conference of Harmonization (ICH). Nov. 1996 (http:/ www.fda.gov/eder/guidance /1320fnl.pdf)

3- Techniques and instrumentation in analytical chemistry, vol.5, John Edward

4- Comprehensive Analytical Chemistry, XLV, M.L.Marina, A. Rios, (EDS)

5- Handbook of instrumental techniques of analytical chemistry, Frank A. Settle

C- Suggested books:

1- Wilson, Charles Owens; Beale, John Marlowe; Block, John H.; Block, John H.; Gisvold, Ole "Wilson & Gisvold's Textbook of Organic :Medicinal and Pharmaceutical

2- British Pharmacopoeia, HM Stationery Office, London, UK, PA, 2007,

3- Martindale: The Complete Drug Reference, Pharmaceutical Press;35 edition (2007)

D- Websites:

www.tandfonline.com/toc/lanl20/current (Analytical Letters)
www.rsc.org

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Hanaa Saleh**
- **Head of Department: Prof Dr/ Hisham Ezzat Abdellatef**
- **Date: 2012-8-28 تم اعتماده فى مجلس القسم بتاريخ**

Physiology

Course specification of ygoloisyhP

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: Microbiology and Immunology
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2012/2013

1- Basic information:

Title: **Physiology** Code: M112
Lectures: 2 hrs/week Credit hours: 2 hrs/week
Total: 2hrs/week

2- Overall aim of the course:

On completion of the course, the students will be able to build up comprehensive knowledge on the overall mammalian physiological functions of the different body organs as well as certain abnormal conditions.

3. Intended learning outcome s (ILOs) of Physiology:

Knowledge and Understanding	
a1	Describe the mechanical, physical, and biochemical functions of humans in good health, their organs, and the cells of which they are composed.
a2	Illustrate the interrelationships between physiology and the society in the field of human health.
Intellectual skills	
b1	Apply the knowledge of physiological prosperities to restore stability.
General and Transferable skills	
d1	Communicate effectively and present ideas and findings clearly in oral and written forms.

4. Course Content of Physiology:

Week number	Lecture contents (2hrs/week)
1	Nerve & Muscle
2	Autonomic Nervous System 1
3	Autonomic Nervous System 2
4	Cardiovascular System 1
5	Cardiovascular System 2
6	Central Nervous System 1
7	Central Nervous System 2
8	Kidney
9	Respiratory System Activity (Review article- Presentation……)
10	GIT
11	Endocrine System 1
12	Endocrine System 2
13	Blood physiology
14	Membrane physiology
15	Revision

5- Teaching and Learning Methods:

- Lectures
- Self learning
- noissucsid nepO

6- Student Assessment methods:

- Written exam to assess: a1, a2 and b1.
- Oral exam to assess: a1, a2, b1 and d1.
- Activity to assess: d1

Assessment schedule:

Assessment (1): Activity	Week 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 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers

B- Essential books:

- Linda S. Costanzo (2007). Board Review Series: Physiology. Lippincott Williams & Wilkins. 4th ed
- Gyton physiology (2006) Arthur C. Guyton , John E. Hall, 11th edition Elsevier Inc.
- Clinical physiology (2005) An Examination Primer Ahis Banerjee , Cambridge University Press.

Facilities required for teaching and learning:

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

- **Course Coordinators: Dr/ Mona Foaud**
- **Head of Department: Prof Dr/ Hassan El-Fayoumy**
- **Date: 2012-9-3 تم اعتماده فى مجلس القسم بتاريخ**

Biostatistics

Course specification of Biostatistics

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: Microbiology and Immunology
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2012/2013

1- Basic information:

Title: **Biostatistics** Code: M111
Lectures: 2 hrs/week Credit hours: 2 hrs/week
Total: 2hrs/week

2- Overall aim of the course:

On completion of the course, the students will be able to design a good research experiment, statistically analyze the results of research experiments and interpret the results of statistical analysis of experimental data.

3. Intended learning outcome s (ILOs) of Biostatistics:

Knowledge and Understanding	
a1	Understand the fundamentals and principles of Biostatistics.
a2	Identify the interrelationships between biostatistics and the society.
a3	Update the information in the field of biostatistics.
Intellectual skills	
b1	Analyze statistically and interpret data obtained from pharmacological experiments in different forms.
b2	Improve experimental design of pharmacological experiments.
General and Transferable skills	
d1	Demonstrate competence in the use of information technology broad enough to meet personal, academic and professional needs.

4. Course Content of Biostatistics:

Week number	Lecture contents (2hrs/week)
1	General Principle of biostatistics 1
2	General Principle of biostatistics 2
3	Presentation of data
4	Descriptive statistics
5	Measures of central tendency
6	Measures of variability
7	Normal frequency distribution curve
8	Probability
9	Comparing of two means Activity
10	Comparing of more than two means
11	Chi square test
12	Regression and correlation analysis
13	Complex analysis
14	Criteria of good experimental design
15	Revision

5- Teaching and Learning Methods:

- Lectures
- Self learning
- noissucsid nepO

6- Student Assessment methods:

- Written exam to assess: a1, a2, a3, b1 and b2.
- Oral exam to assess: a1, a2, a3, b1, b2 and d1.
- Activity to assess: d1

Assessment schedule:

Assessment (1): Activity	Week 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 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers

B- Essential books:

- Danial W (1995). Biostatistics: A foundation for analysis in health science. (6^{th} ed.) New York: John Wipij & sensing

C- Electronic resources

- Dom Spina (2003) Statistics Workshop distance learning material. British Pharmacological Society University of Manchester

Facilities required for teaching and learning:

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

- **Course Coordinators: Dr/ Shaimaa El-Shazly**
- **Head of Department: Prof Dr/ Hassan El-Fayoumy**
- **Date: 2012-9-3 تم اعتماده فى مجلس القسم بتاريخ**

Drug induced disease

Course specification of Drug Induced Disease

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: Microbiology and Immunology
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2012/2013

1- Basic information:

Title: **Drug Induced Disease** Code: ME7
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 define the mechanisms and symptoms of drug induced hepatotoxicity and diagnose possible drug induced hepatotoxicity and how to prevent it.

3. Intended learning outcome s (ILOs) of Drug Induced Disease:

Knowledge and Understanding	
a1	Illustrate principles of drug induced hepatotoxicity.
a2	Demonstrate the relation between different drug classes and the liver functions.
Intellectual skills	
b1	Suggest possible ways to protect against drug induced hepatotoxicity.
b2	Specify different methods for diagnosis and management of liver injury.
General and Transferable skills	
d1	Get access of pharmacological information from a variety of sources.

4. Course Content of Drug Induced Disease:

Week number	Lecture contents (4hrs/week)
1	Introduction to drug induced disease
2	Liver physiology and pathophysiology
3	Metabolism and mechanisms of liver injury
4	Diagnosis and management of liver injury
5	Animal models of hepatotoxicity
6	Hepatotoxicity of specific drugs (Acetaminophen)
7	Hepatotoxicity of specific drugs (NSAIDs)
8	Hepatotoxicity of specific drugs (Anticonvulsants)
9	Hepatotoxicity of specific drugs (Drugs of abuse) Activity
10	Hepatotoxicity of specific drugs (Antiviral drugs)
11	Hepatotoxicity of specific drugs (Natural medicine)
12	Hepatotoxicity of specific drugs (Cancer

	Chemotherapy)
13	Presentations
14	Open discussion
15	Revision

5- Teaching and Learning Methods:

- Lectures
- Self learning
- noissucsid nepO

6- Student Assessment methods:

Student Assessment methods:

- Written exam to assess: a1, a2, b1 and b2.
- Oral exam to assess: a1, a2, b1, b2 and d1.
- Activity to assess: d1

Assessment schedule:

Assessment (1): Activity	Week 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 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers

B- Essential books:

- Basic and clinical Pharmacology; 10th Edition, Kantzung B.G McGraw Hill Medical Publishing Division 2007.

Facilities required for teaching and learning:

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

- **Course Coordinators: Dr/ Waleed Barakat**
- **Head of Department: Prof Dr/ Hassan El-Fayoumy**
- **Date: 2012-9-3 تم اعتماده فى مجلس القسم بتاريخ**

Applied pharmacology

Course specification of Applied Pharmacology

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: Microbiology and Immunology
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2012/2013

1- Basic information:

Title: **Applied Pharmacology** Code: ME5
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 mention the actions and uses of a number of pharmacologically active drug classes and explain the mechanisms by which different classes of drugs act.

3. Intended learning outcome s (ILOs) of Applied Pharmacology:

Knowledge and Understanding	
a1	Demonstrate sufficient knowledge about classes of drugs used to treat different diseases.
a2	Relate applied pharmacology to community health practices.
Intellectual skills	
b1	Integrate different aspects of pharmacology to suggest solutions for professional problems.
b2	Decide the suitable solution for unpredictable situations.
General and Transferable skills	
d1	Recognize learning needs and how to fulfill them.

4. Course Content of Applied Pharmacology:

Week number	Lecture contents (4hrs/week)
1	Drugs used in Parkinson's disease
2	Drugs used in Alzheimer disease
3	Antiepileptic drugs 1
4	Antiepileptic drugs 2
5	Antidepressants
6	Analgesics 1
7	Analgesics 2
8	Antipsychotics
9	Antihypertensive 1 Activity
10	Antihypertensive 2
11	Diuretics 1
12	Diuretics 2
13	Anti diabetic drugs 1
14	Anti diabetic drugs 2
15	Revision

5- Teaching and Learning Methods:

- Lectures
- Self learning
- noissucsid nepO

6- Student Assessment methods:

Student Assessment methods:

- Written exam to assess: a1, a2, b1and b2
- Oral exam to assess: a1, a2, b1, b2 and d1.
- Activity to assess: d1

Assessment schedule:

Assessment (1): Activity	Week 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 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers

B- Essential books:

- Basic and clinical Pharmacology; 10th Edition, Katzung B.G. McGraw Hill Medical Publishing Division 2007.
- Clinical Pharmacology; 8th Edition, Laurence D.R, Bennett P.N, Brown M.J, Churchill livingstone 1997.

C- Suggested books:

- Integrated Pharmacology; 3rd Edition, Page P.C; J.M; Walker U.M; Hoffman B.B. Elsevier Mosby 2006.
- Rang and Dales Pharmacology; Rang P.H., Dale M.M., Ritter M.J., Flower J.R. Churchill livingstone Elsevier 2007.

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Rasha Hassan**
- **Head of Department: Prof Dr/ Hassan El-Fayoumy**
- **Date: 2012-9-3 تم اعتماده فى مجلس القسم بتاريخ**

Special Courses

Advanced Microbial Biotechnology

Course Specification of Advanced Microbial Biotechnology

A- Course specifications:

- **Program on which the course is given:** M. Pharm. Sc.
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology
- **Date of specification approval:** 2012/2013

1-Basic Information:

Title: Advanced Microbial Biotechnology Code: Isp1
Credit hours: 4hrs/week Lectures: 4hrs/week
Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to describe the components of biotechnology, describe the exploitation of gene cloning and recombinant DNA technology in production of useful microbial industrial strains , apply conventional genetic approaches and molecular genetics approaches in biotechnology and explain the bases of molecular genetics, and basic gene cloning strategies and tools.

3-Intended learning outcomes (ILOS) of Advanced Microbial Biotechnology:

A-Knowledge and Understanding	
a1	Illustrate the principles of advanced microbial biotechnology
a2	Recognize the effect of applications of biotechnology on the environment
a3	Illustrate up-to-date information about recent techniques of biotechnology
B-Intellectual skills	
b1	Analyze and interpret data obtained from biotechnology researches in a specific and suitable form
D- General and Transferable skills	
d1	Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
d2	Retrieve information from various sources in the field of microbiology.
d3	Work effectively as a member of team.
d4	Study independently for continuous self learning and plan research studies.

4-Course content of Advanced Microbial Biotechnology:

Week number	Lecture content (4 hrs/week)
1	Introduction to Industrial Microbiology and biotechnology: Definition, concept and scope- history and achievements.
2	upstream processes: Industrial Strains (Finding, Isolation and Improvement, Maintenance of Strains) Substrates and media for Industrial Fermentation: types, formulation
3	Fementors: Types, design, basic function, operation
4	Downstream processing: Recovery of Fermentation Products
5	Types of Fermentation Products: Cells or its Components(Microbial Biomass, Capsular Material, Exotoxins); Microbial Enzymes; Primary Metabolites (Alcohols and Solvents, Fatty Acids, Amino Acids); Secondary Metabolites: (Antibiotics, Vitamins); Biotransformations (Steroid Transformations, Other Transformation Products)
6	Activity
7	Fundamentals of Gene Cloning and Recombinant DNA Technology Cloning vectors: plasmid, cosmids, phagemids, pahsmid and yeast cloning vector- structural, functional organization and their uses.
8	Gene bank: construction of gene bank by cloning techniques and c-DNA library.
9	Cloning hosts and cloning strategies
10	Screening of cloned product: DNA hybridization, colony hybridization, in-situ hybridization and PCR
11	Enzymes in biotechnology: Nuclease- restriction endo nuclease- types and uses, Polymerase, Ligase, Reverse transcriptase, Topoisomerase, alkaline phosphatase and poly nucleotide kinase.
12	Molecular probes: production, labeling and applications
13	Applications of molecular biotechnology Production of Human Proteins: Human Insulin, Anticoagulants, Human Growth Hormone, Interferons, Interleukins, Blood Factors Hybridoma Technology and Production of Monoclonal Antibodies Other Applications

14	Revision
15	Open discussion

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6-Student Assessment methods:

- Written exams to assess: a1, a2, a3, b1
- Oral exam to assess: a1, a2, a3, b1
- Activity to assess: d2, d4, d6, d8

Assessment schedule:

Assessment (1): Activity	Week 6
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 %
TOTAL	**100**	**100%**

7-Rreferences &books:

A – Scientific Papers

B- Essential Books

1. Waites, M.J; Morgan, N. L.; Rockey, N.S.; Higon, G. (2001). Industrial Microbiology: An Introduction. Blackwell Science. Oxford.

2. Hugo and Russell's Pharmaceutical Microbiology, 7th edn. (2004) Edited by Stephen P. Denyer, Norman A. Hodges, and Sean P. Gorman, Blackwell Science Inc.; Massachusetts, USA.
3. Peppier, H-J. and Prelman, D. (1979). Microbial Technology and Fermentation Technology. Vol.1 and II. Academic Press. NY.
4. Ward, O.P. (1989). Fermentation Biotechnology: Principles, Processes and products. Prentice Hall Engle wood Cliffs New Jersey.

C -Suggested Books:

1. Watson, J.D., Hopkins, N.H., Roberts, J.W.. Steitz, J.A- and Weiner, A.M. (1987). Molecular biology of the gene. 4th Edn. The Benjanun/cummmgs Publishing Company Inc. NY.
2. Watson, JB., Gflnian, M., Witkowshi, J. and Zoller, M. (1992). Recombinant DNA. 2Dd Edn. Scientific American Books.
3. Glick BR, and Pasternak JJ (1994), "Molecular Biotechnology, principles and applications of recombinant DNA. ASM Press. Washington DC

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Ashraf Ahmed Kadry**
- **Head of Department: Prof Dr/ Hemmat Kamal Abdellatif**
- **Date:**

Matrix I Advanced microbial biotechnology (2012-2013)

	Course Contents	Knowledge and Understanding			Intellectual skills	General and transferable skills			
		a1	a2	a3	b1	d1	d2	d3	d4
1	Introduction to Industrial Microbiology and biotechnology: Definition, concept and scope- history and achievements.	x							
2	upstream processes: Industrial Strains (Finding, Isolation and Improvement, Maintenance of Strains) Substrates and media for Industrial Fermentation: types, formulation	x							
3	Fementors: Types, design, basic function, operation	x							
4	Downstream processing: Recovery of Fermentation Products	x							
5	Types of Fermentation Products: Cells or its Components(Microbial Biomass, Capsular Material, Exotoxins); Microbial Enzymes; Primary Metabolites (Alcohols and Solvents, Fatty Acids, Amino Acids); Secondary Metabolites: (Antibiotics, Vitamins); Biotransformations (Steroid Transformations, Other Transformation Products)	x	x	x	x				
6	Activity					x	x	x	
7	Fundamentals of Gene Cloning and Recombinant DNA Technology Cloning vectors: plasmid, cosmids, phagemids, pahsmid and yeast cloning vector- structural, functional organization and their uses.	x	x	x	x				
8	Gene bank: construction of gene bank by cloning techniques and c-DNA library.	x	x	x	x				
9	Cloning hosts and cloning strategies	x	x	x	x				
10	Screening of cloned product: DNA hybridization, colony hybridization, in-situ hybridization and PCR	x	x	x	x				

11	Enzymes in biotechnology: Nuclease- restriction endo nuclease-types and uses, Polymerase, Ligase, Reverse transcriptase, Topoisomerase, alkaline phosphatase and poly nucleotide kinase.	**x**	**x**	**x**	**x**			
12	Molecular probes: production, labeling and applications	**x**	**x**	**x**	**x**			
13	Applications of molecular biotechnology Production of Human Proteins: Human Insulin, Anticoagulants, Human Growth Hormone, Interferons, Interleukins, Blood Factors Hybridoma Technology and Production of Monoclonal Antibodies Other Applications	**x**	**x**	**x**	**x**			
14	Revision	**x**	**x**	**x**	**x**			
15	Open discussion	**x**	**x**	**x**	**x**			

Matrix II Advanced microbial biotechnology (2012-2013)										
NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Illustrate properly the principle of microbiology and their widely growing subjects including molecular biology, biotechnology, clinical microbiology, pharmaceutical microbiology.	a1	Introduction to Industrial Microbiology and biotechnology: Definition, concept and scope- history and achievements.	Textbooks, Scientific papers and self learning	x	x	x	x	
				upstream processes: Industrial Strains (Finding, Isolation and Improvement, Maintenance of Strains) Substrates and media for Industrial Fermentation: types, formulation		x	x	x	x	
				Fementors: Types, design, basic function, operation		x	x	x	x	
				Downstream processing: Recovery of Fermentation Products		x	x	x	x	

				Types of Fermentation Products: Cells or its Components(Microbial Biomass, Capsular Material, Exotoxins); Microbial Enzymes; Primary Metabolites (Alcohols and Solvents, Fatty Acids, Amino Acids); Secondary Metabolites: (Antibiotics, Vitamins); Biotransformations (Steroid Transformations, Other Transformation Products)		x	x	x	x	
				Fundamentals of Gene Cloning and Recombinant DNA Technology		x	x	x	x	
				Cloning vectors: plasmid, cosmids, phagemids, pahsmid and yeast cloning vector-structural, functional organization and their uses.		x	x	x	x	
				Gene bank: construction of gene bank by cloning techniques and c-DNA library.		x	x	x	x	
				Cloning hosts and cloning strategies		x	x	x	x	
				Screening of cloned product: DNA hybridization, colony hybridization, in-situ hybridization and PCR		x	x	x	x	

				Enzymes in biotechnology: Nuclease- restriction endo nuclease-types and uses, Polymerase, Ligase, Reverse transcriptase, Topoisomerase, alkaline phosphatase and poly nucleotide kinase.		x	x	x	x	
				Molecular probes: production, labeling and applications		x	x	x	x	
				Applications of molecular biotechnology Production of Human Proteins: Human Insulin, Anticoagulants, Human Growth Hormone, Interferons, Interleukins, Blood Factors Hybridoma Technology and Production of Monoclonal Antibodies Other Applications		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	

	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2-Outline the influence of microbiology branches on the environment	a2	Types of Fermentation Products: Cells or its Components(Microbial Biomass, Capsular Material, Exotoxins); Microbial Enzymes; Primary Metabolites (Alcohols and Solvents, Fatty Acids, Amino Acids); Secondary Metabolites: (Antibiotics, Vitamins); Biotransformations (Steroid Transformations, Other Transformation Products)	Textbooks, Scientific papers and self learning	x	x	x	x	
				Fundamentals of Gene Cloning and Recombinant DNA Technology		x	x	x	x	
				Cloning vectors: plasmid, cosmids, phagemids, pahsmid and yeast cloning vector-structural, functional organization and their uses.		x	x	x	x	
				Gene bank: construction of gene bank by cloning techniques and c-DNA library.		x	x	x	x	
				Cloning hosts and cloning strategies		x	x	x	x	

				Screening of cloned product: DNA hybridization, colony hybridization, in-situ hybridization and PCR		x	x	x	x	
				Enzymes in biotechnology: Nuclease- restriction endo nuclease-types and uses, Polymerase, Ligase, Reverse transcriptase, Topoisomerase, alkaline phosphatase and poly nucleotide kinase.		x	x	x	x	
				Molecular probes: production, labeling and applications		x	x	x	x	
				Applications of molecular biotechnology Production of Human Proteins: Human Insulin, Anticoagulants, Human Growth Hormone, Interferons, Interleukins, Blood Factors Hybridoma Technology and Production of Monoclonal Antibodies Other Applications		x	x	x	x	
				Revision		x	x	x	x	

				Open discussion		x	x	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.3- Illustrate the developments in the field of biotechnology and genetics and their applications	a3	Types of Fermentation Products: Cells or its Components(Microbial Biomass, Capsular Material, Exotoxins); Microbial Enzymes; Primary Metabolites (Alcohols and Solvents, Fatty Acids, Amino Acids); Secondary Metabolites: (Antibiotics, Vitamins); Biotransformations (Steroid Transformations, Other Transformation Products)	Textbooks, Scientific papers and self learning	x	x	x	x	
				Fundamentals of Gene Cloning and Recombinant DNA Technology		x	x	x	x	
				Cloning vectors: plasmid, cosmids, phagemids, pahsmid and yeast cloning vector- structural, functional organization and their uses.		x	x	x	x	
				Gene bank: construction of gene bank by cloning techniques and c-DNA library.		x	x	x	x	

				Cloning hosts and cloning strategies		x	x	x	x	
				Screening of cloned product: DNA hybridization, colony hybridization, in-situ hybridization and PCR		x	x	x	x	
				Enzymes in biotechnology: Nuclease- restriction endo nuclease-types and uses, Polymerase, Ligase, Reverse transcriptase, Topoisomerase, alkaline phosphatase and poly nucleotide kinase.		x	x	x	x	
				Molecular probes: production, labeling and applications		x	x	x	x	
				Applications of molecular biotechnology Production of Human Proteins: Human Insulin, Anticoagulants, Human Growth Hormone, Interferons, Interleukins, Blood Factors Hybridoma Technology and Production of Monoclonal Antibodies Other Applications		x	x	x	x	

				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
2.2	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from microbiology research in a specific and suitable form.	b1	Types of Fermentation Products: Cells or its Components(Microbial Biomass, Capsular Material, Exotoxins); Microbial Enzymes; Primary Metabolites (Alcohols and Solvents, Fatty Acids, Amino Acids); Secondary Metabolites: (Antibiotics, Vitamins); Biotransformations (Steroid Transformations, Other Transformation Products)	Textbooks, Scientific papers and self learning	x	x	x	x	

				Fundamentals of Gene Cloning and Recombinant DNA Technology		x	x	x	x	
				Cloning vectors: plasmid, cosmids, phagemids, pahsmid and yeast cloning vector- structural, functional organization and their uses.		x	x	x	x	
				Gene bank: construction of gene bank by cloning techniques and c-DNA library.		x	x	x	x	
				Cloning hosts and cloning strategies		x	x	x	x	
				Screening of cloned product: DNA hybridization, colony hybridization, in-situ hybridization and PCR		x	x	x	x	
				Enzymes in biotechnology: Nuclease- restriction endo nuclease-types and uses, Polymerase, Ligase, Reverse transcriptase, Topoisomerase, alkaline phosphatase and poly nucleotide kinase.		x	x	x	x	
				Molecular probes: production, labeling and applications		x	x	x	x	

				Applications of molecular biotechnology Production of Human Proteins: Human Insulin, Anticoagulants, Human Growth Hormone, Interferons, Interleukins, Blood Factors Hybridoma Technology and Production of Monoclonal Antibodies Other Applications		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
2.4	2.4.2 Effectively use information technology in professional practices	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of microbiology.	d2	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.6- Work in a team and lead teams	D.6- Work effectively as a member of team.	d3	Activity	Textbooks, Scientific papers and		x			

	carrying out various professional tasks.				self learning					x
	2.4.8- Continuous and self learning.	D.8- Study independently for continuous self learning and plan research studies.	d4	Activity	Textbooks, Scientific papers and self learning		x			x

Advanced Pharmaceutical Microbiology

Course Specifications of Advanced Pharmaceutical Microbiology

A- Course specifications:

- **Program on which the course is given:** M. Pharm. Sc.
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology
- **Date of specification approval:** 2012/2013

1-Basic Information:

Title: Advanced Pharmaceutical Microbiology Code: Isp2
Lectures: 4hrs/week Credit hours: 4hrs/week
Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to describe all aspects of antimicrobial agent, including types, spectra, mechanisms of action, uses, limitations, microbial resistance and their evaluation, explain the principles and theoretical aspects of microbiological assays and quality assurance and quality control tests in pharmaceutical practice, evaluate the microbial quality of pharmaceutical products, assess microbial stability and spoilage, and evaluate efficacy of antimicrobial preparations and review all aspects of industrial fermentations and recombinant DNA technology in production of drugs and raw material for pharmaceuticals.

3-Intended learning outcomes (ILOS) of Advanced pharmaceutical microbiology:

A-Knowledge and Understanding	
a1	Outline the basic information related to pharmaceutical microbiology
a2	Identify the impact of control of microorganisms by different methods on the environment
a3	Evaluate the microbial quality of pharmaceutical products and understand its impact on the environment
a4	Recognize the effect of biotechnology on the environment
a5	Illustrate up-to-date information about different methods of control of microorganisms and recent techniques of biotechnology
B- Intellectual skills	
b1	Analyze and interpret data obtained from microbiology research in a specific and suitable form
D- General and Transferable skills	
d1	Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
d2	Retrieve information from various sources in the field of microbiology.
d3	Work effectively as a member of team.
d4	Study independently for continuous self learning and plan research studies.

4-Course contents of Advanced pharmaceutical microbiology (Master degree):

Week number	Lecture content (4 hr/w)
1	Principles and practices of sterilization: sterilization processes and aseptic manipulation, sterilization assurance and validation of sterilization processes
2	Clean and aseptic areas and GMP
3	Antimicrobial agents and their evaluation: Antimicrobial chemotherapeutic agents: types, spectra of actions, modes of actions, their clinical use, mechanisms of resistance to antibiotics, and methods of investigation, and control of resistance.
4	Antimicrobial agents and their evaluation: Chemical antimicrobial agents: types and uses of non-antibiotic antimicrobial agents (sterilants, disinfectants, antiseptics, preservatives), their mode of action, mechanisms of microbial resistance and evaluation of their action
5	Microbiological aspects of pharmaceutical processing: Ecology of microorganisms as it effects the pharmaceutical industry; Factory and hospital hygiene and good manufacturing practice
6	Microbial Contamination and spoilage of Pharmaceutical Products: impact of contamination and spoilage, control of microbial contamination and quality assurance of pharmaceutical products, preservation of pharmaceutical products Microbiological quality assessment and control
7	Activity
8	Traditional biotechnology: Pharmaceuticals of Microbial Origin, and bioremediation; manufacture of antibiotics, manufacture and quality control of immunological products
9	Molecular biotechnology: fundamentals of recombinant DNA technology
10	Molecular biotechnology: production of therapeutically useful substances by recombinant DNA technology
11	Additional applications of microorganisms in the pharmaceutical sciences

12	Microbiological Assays in Pharmacy. The principles and techniques of microbiological assays of drugs.
13	Microbiological Tests in Pharmacy. The principles and techniques of microbiological analysis and tests; quality assessment of drugs, cosmetics and food.
14	Revision
15	open discussion

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6-Student Assessment methods:

- Written exam to assess: a1, a2, a3, a4, a5, b1
- Oral exam to assess: a1, a2, a3, a4, a5, b1
- Activity to assess: d2, d4, d6, d8

Assessment schedule:

Assessment (1): Activity	Week 6
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 %
TOTAL	**100**	**100%**

7-Rreferences &books

A –Scientific papers

B- Essential Books

- Hugo and Russell's Pharmaceutical Microbiology 7th edn. Edited by Stephen P Denyer, Norman A Hodges, and Sean P Gorman, Blackwell Science Inc.; Massachusetts, USA (2004).
- "Sterilization, Disinfection and Preservation" 4th edn, Ed Block SS, Lippincott Williams & Wilkins, London (2001).
- Maurer I M (1985) Hospital hygiene 3rd ed. London : Edward Arnold
- Murray, P.R. (2001) Medical microbiology. 4th ed. London : Mosby
- Turco S and King R E (1994) Sterile dosage forms 4th ed. Philadelphia : Lea & Febiger
- "Molecular Biotecnology", Pasternak G, ASM press, Washington DC (1994).
- Therapeutic guidelines. (2000) North Melbourne, Vic. : Therapeutic Guidelines Limited.
- "Antibiotics in Laboratory Medicine", 4th edition, Ed Lorian V, Williams and Wilkins, Baltimore (1996)

C -Suggested Books

- Casida, L.E. (1964). Industrial Microbiology. Wiley Eastern Ltd. New Delhi.
- Dasilva, E.T.. Dommergues. Y.R.. Nyms, E.T. and Rottedge. (1988). Microbial Technology in the Developing World. Oxford Univ. Press Oxford.
- Bemain, A.L. and Solomon, N.A. (1986). Manual of Industrial Microbiology and Biochemistry. American Society for Microbiology, Washington.
- Ghosh, T.K. (1990). Bioproccsses, Computation in Biotechnology. Vol-I Euis Harwood NY.
- Halvorson, HO., Pramer, D. and Rogul, M (1985). Engineered Organisms in the
- Environment. Scientific Issues. American Society for Microbiology, Washington. NY.
- Old, R.W. and Primrose, S.B. (1989). Principles of Gene Manipulation. 4th Edn. Black
- Well Scientific Pub. London.

- Peppier, H-J. and Prelman, D. (1979). Microbial Technology and Fermentation Technology. Vol.1 and II. Academic Press. NY.
- Reed, G. (1982). Industrial Microbiology. Mac Millan Publishers Ltd. Wisconsin.
- Ward, O.P. (1989). Fermentation Biotechnology: Principles, Processes and products. Prentice Hall Engle wood Cliffs New Jersey.
- Watson, J.D., Hopkins, N.H., Roberts, J.W.. Steitz, J.A- and Weiner, A.M. (1987). Molecular biology of the gene. 4th Edn. The Benjanun/cummmgs Publishing Company Inc. NY.
- Watson, JB., Gflnian, M., Witkowshi, J. and Zoller, M. (1992). Recombinant DNA. 2Dd Edn. Scientific American Books

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinator: Prof Dr/ Fathy Mohammed El-Sayed Serry**
- **Head of Department: Prof Dr/ Hemmat Kamal Abdellatif**
- **Date:**

Matrix I of Advanced pharmaceutical microbiology (2012-2013)

	Course Contents	ILOs of Advanced pharmaceutical microbiology course									
		Knowledge and Understanding					Intellectual skills	General and transferable skills			
		a 1	a 2	a 3	a 4	a 5	b1	d1	d2	d3	d4
1	Principles and practices of sterilization: sterilization processes and aseptic manipulation, sterilization assurance and validation of sterilization processes	x	x			x	x				
2	clean and aseptic areas and GMP	x	x				x				
3	Antimicrobial agents and their evaluation: Antimicrobial chemotherapeutic agents: types, spectra of actions, modes of actions, their clinical use, mechanisms of resistance to antibiotics, and methods of investigation, and control of resistance.	x	x			x	x				
4	Antimicrobial agents and their evaluation: Chemical antimicrobial agents: types and uses of non-antibiotic antimicrobial agents (sterilants, disinfectants, antiseptics, preservatives), their mode of action, mechanisms of microbial resistance and evaluation of their action	x	x			x	x				
5	Microbiological aspects of pharmaceutical processing: Ecology of microorganisms as it effects the pharmaceutical industry; Factory and hospital hygiene and good manufacturing practice	x		x			x				
6	Microbial Contamination and spoilage of Pharmaceutical Products: impact of contamination and spoilage, control of microbial contamination and quality assurance of pharmaceutical products, preservation of pharmaceutical products Microbiological quality assessment and control	x		x			x				

7	Activity							**x**	**x**	**x**	**x**
8	Traditional biotechnology: Pharmaceuticals of Microbial Origin, and bioremediation; manufacture of antibiotics, manufacture and quality control of immunological products	**x**			**x**	**x**	**x**				
9	Molecular biotechnology: fundamentals of recombinant DNA technology	**x**			**x**	**x**	**x**				
10	Molecular biotechnology: production of therapeutically useful substances by recombinant DNA technology	**x**			**x**	**x**	**x**				
11	Additional applications of microorganisms in the pharmaceutical sciences	**x**				**x**	**x**				
12	Microbiological Assays in Pharmacy. The principles and techniques of microbiological assays of drugs.	**x**		**x**			**x**				
13	Microbiological Tests in Pharmacy. The principles and techniques of microbiological analysis and tests; quality assessment of drugs,	**x**		**x**			**x**				
14	Revision	**x**	**x**	**x**	**x**	**x**	**x**				
15	open discussion	**x**	**x**	**x**	**x**	**x**	**x**				

Matrix II of Advanced pharmaceutical microbiology (2012-2013)									
NARS	Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
					Lecture	Self learning	Written exam	Oral exam	Activity

2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Illustrate properly the principle of microbiology and their widely growing subjects including molecular biology, biotechnology, clinical microbiology, pharmaceutical microbiology.	a1	• Principles and practices of sterilization • Clean and aseptic areas and GMP • Antimicrobial agents and their evaluation • Microbiological aspects of pharmaceutical processing • Microbial Contamination and spoilage of Pharmaceutical Products • Microbiological quality assessment and control • Traditional biotechnology • Molecular biotechnology • Additional applications of microorganisms in the pharmaceutical sciences • Microbiological assayss in Pharmacy • Microbiological Tests in Pharmacy • Revision • open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2-Outline the influence of microbiology branches on the environment	a2	• Principles and practices of sterilization • clean and aseptic areas and GMP • Antimicrobial agents and their evaluation • Revision • open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	

			a3	• Microbiological aspects of pharmaceutical processing • Microbial Contamination and spoilage of Pharmaceutical Products • Microbiological quality assessment and control • Microbiological Assays in Pharmacy. The principles and techniques of microbiological assays of drugs. • Microbiological Tests in Pharmacy. The principles and techniques of microbiological analysis and tests; quality assessment of drugs, • Revision • open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	

			a4	• Traditional biotechnology • Molecular biotechnology • Additional applications of microorganisms in the pharmaceutical sciences • Revision • open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.3- Illustrate the developments in the field of biotechnology and genetics and their applications	a5	- Principles and practices of sterilization - Antimicrobial agents and their evaluation - Traditional biotechnology - Molecular biotechnology - Additional applications of microorganisms in the pharmaceutical sciences - Revision - Open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.	a3	• Microbiological aspects of pharmaceutical processing • Microbial Contamination and spoilage of Pharmaceutical Products • Microbiological quality assessment and control • Revision • open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	
2.2	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from microbiology research in a specific and suitable form.	b1	Microbial Contamination and spoilage of Pharmaceutical Products: impact of contamination and spoilage, control of microbial contamination and quality assurance of pharmaceutical products, preservation of pharmaceutical products	Textbooks, Scientific papers and self learning	x	x	x	x	
2.4	2.4.2 Effectively use information technology in professional practices	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity	Textbooks, Scientific papers and self learning		x			x

	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of microbiology.	d2	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team.	d3	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.8- Continuous and self learning.	D.8- Study independently for continuous self learning and plan research studies.	d4	Activity	Textbooks, Scientific papers and self learning		x			x

Clinical Microbiology

Course Specification of Clinical Microbiology

A- Course specifications:

- **Program on which the course is given:** M. Pharm. Sc.
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology
- **Date of specification approval:** 2012/2013

1-Basic Information:

Title: Clinical Microbiology Code: Isp3
Credit hours: 4hrs/week Lectures: 4hrs/week
Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to describe the common microbial pathogens and the mechanisms of pathogenesis, describe the clinical manifestation of disease and diagnose disease based on clinical laboratory data, describe the epidemiology of infectious diseases and control measures and discuss the treatment of disease.

3-Intended learning outcomes (ILOS) of Clinical Microbiology:

A-Knowledge and Understanding	
a1	Recognize the basic principles of clinical microbiology and the most important microbial infections
a2	Identify the effect of diagnosis and treatment of different infections on the environment
B- Intellectual skills	
b1	Take professional decisions in selection of the most methods for diagnosis and treatment of different infections
D- General and Transferable skills	
d2	Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
d4	Retrieve information from various sources in the field of microbiology.
d6	Work effectively as a member of team.
d8	Study independently for continuous self learning and plan research studies.

4-Course content of Clinical Microbiology:

Week number	Lecture content (4hrs/week)
1	Safety measures, specimen collection, transportation, storage, and safe handling and processing.
2	Microbial diseases of skin: Bacterial diseases: Staphylococcal infections, Streptococcal infections
3	Microbial diseases of skin: Bacterial diseases: Infections by Pseudomonas, Propionibacterium infections
4	Microbial diseases of skin: Viral diseases (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)
5	Microbial diseases of skin: Fungal diseases (Cutaneous mycoses, Candidiasis)
6	Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis
7	Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common cold, influenza
8	Activity
9	Microbial disease of digestive system Bacterial diseases: Oral diseases; dental caries, periodontal disease Bacterial diseases of digestive tract: enteric fever, cholera, bacillary dysentery
10	Microbial disease of digestive system Fungal diseases: Mycotoxins production Viral diseases: Mumps, Gastroenteritis, Hepatitis
11	Microbial diseases of cardiovascular system Bacterial diseases: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral diseases: Yellow fever, Dengue fever
12	Diseases of urinary and reproductive system: Bacterial diseases: Enterobacteriaceae infections, Gonorrhoea,

	Syphilis, Chancroid Fungal infections: Candidiasis Viral infections: Genital herpes, AIDS
13	Microbial diseases of nervous system Bacterial diseases: Bacterial meningitis, Tetanus, Botulism, leprosy Fungal diseases: cryptococcosis Viral diseases: Arthropod-borne encephalitis, Rabies, poliomyelitis
14	Revision
15	Open discussion

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6-Student Assessment methods:

- Written exam to assess: a1, a2, b1
- Oral exam to assess: a1, a2, b1
- Activity to assess: d2, d4, d6, d8

Assessment schedule:

Assessment (1): Activity	Week 8
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 %
TOTAL	**100**	**100%**

7-Rreferences &books

A –Scientific papers

B- Essential Books

5. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 5th ed. (Philadelphia: Elsevier/Mosby, 2005).
6. Levinson, W. Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill, 2006).
7. Brooks, G.F.; Carroll, K. C.; Butel, J.S.; Morse, S. A. (2007): Jawetz, Melnick and Adelberg's Medical Microbiology. 24th ed. McGraw-Hill.

C -Suggested Books

1. Infectious Disease: A Clinical Short Course by F.S. Southwick, McGraw-Hill, 2007.

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof.Dr/ Hemmat Kamal Abdellatif**
- **Head of Department: Prof. Dr/ Hemmat Kamal Abdellatif**
- **Date:**

Matrix I of Clinical Microbiology (2012-2013)								
Course Contents		ILOs of Clinical Microbiology course						
		Knowledge and Understanding		Intellectual skills	General and transferable skills			
		a1	a2	b1	d1	d2	d3	d4
1	Safety measures, specimen collection, transportation, storage, and safe handling and processing.	x						
2	Microbial diseases of skin: Bacterial diseases: Staphylococcal infections, Streptococcal infections	x	x	x				
3	Microbial diseases of skin: Bacterial diseases: Infections by Pseudomonas, Propionibacterium infections	x	x	x				
4	Microbial diseases of skin: Viral diseases (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)	x	x	x				
5	Microbial diseases of skin: Fungal diseases (Cutaneous mycoses, Candidiasis)	x	x	x				
6	Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis	x	x	x				
7	Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common cold, influenza	x	x	x				
8	Activity				x	x	x	x
9	Microbial disease of digestive system Bacterial diseases: Oral diseases; dental caries, periodontal disease Bacterial diseases of digestive tract: enteric fever, cholera, bacillary dysentery	x	x	x				

10	Microbial diseases of digestive system Fungal diseases: Mycotoxins production Viral diseases: Mumps, Gastroenteritis, Hepatitis	**x**	**x**	**x**				
11	Microbial diseases of cardiovascular system Bacterial diseases: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral diseases: Yellow fever, Dengue fever	**x**	**x**	**x**				
12	Diseases of urinary and reproductive system: Bacterial diseases: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid Fungal infections: Candidiasis Viral infections: Genital herpes, AIDS	**x**	**x**	**x**				
13	Microbial diseases of nervous system Bacterial diseases: Bacterial meningitis, Tetanus, Botulism, leprosy Fungal diseases: cryptococcosis Viral diseases: Arthropod-borne encephalitis, Rabies, poliomyelitis	**x**	**x**	**x**				
14	Revision	**x**	**x**	**x**				
15	Open discussion	**x**	**x**	**x**				

Matrix II of Clinical Microbiology (2012-2013)

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Illustrate properly the principle of microbiology and their widely growing subjects including molecular biology, biotechnology, clinical microbiology, pharmaceutical microbiology.	a1	Safety measures, specimen collection, transportation, storage, and safe handling and processing.	Textbooks, Scientific papers and self learning	x	x	x	x	
				Microbial diseases of skin:Bacterial diseases: Staphylococcal infections, Streptococcal infections		x	x	x	x	
				Microbial diseases of skin:Bacterial diseases: Infections by Pseudomonas, Propionibacterium infections		x	x	x	x	
				Microbial diseases of skin:Viral diseases (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)		x	x	x	x	
				Microbial diseases of		x	x	x	x	

				skin:Fungal diseases (Cutaneous mycoses, Candidiasis)					x	
				Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis		x	x	x	x	
				Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common cold, influenza		x	x	x	x	
				Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common		x	x	x	x	

				cold, influenza						
				Microbial disease of digestive system Bacterial diseases: Oral diseases; dental caries, periodontal disease Bacterial diseases of digestive tract: enteric fever, cholera, bacillary dysentery		x	x	x	x	
				Microbial diseases of digestive system Fungal diseases: Mycotoxins production Viral diseases: Mumps, Gastroenteritis, Hepatitis		x	x	x	x	
						x	x	x	x	

				Microbial diseases of cardiovascular system Bacterial diseases: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral diseases: Yellow fever, Dengue fever		x	x	x	x	
				Diseases of urinary and reproductive system: Bacterial diseases: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid Fungal infections: Candidiasis Viral infections: Genital herpes, AIDS		x	x	x	x	

				Microbial diseases of nervous system Bacterial diseases: Bacterial meningitis, Tetanus, Botulism, leprosy Fungal diseases: cryptococcosis Viral diseases: Arthropod-borne encephalitis, Rabies, poliomyelitis		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2-Outline the influence of microbiology branches on the environment	a2	Microbial diseases of skin:Bacterial diseases: Staphylococcal infections, Streptococcal infections	Textbooks, Scientific papers and self learning	x	x	x	x	
				Microbial diseases of skin:Bacterial diseases: Infections by Pseudomonas, Propionibacterium infections		x	x	x	x	

				Microbial diseases of skin:Viral diseases (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)		x	x	x	x	
				Microbial diseases of skin:Fungal diseases (Cutaneous mycoses, Candidiasis)		x	x	x	x	
									x	
				Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis		x	x	x	x	
				Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common cold, influenza		x	x	x	x	

				Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common cold, influenza		x	x	x	x	
				Microbial disease of digestive system Bacterial diseases: Oral diseases; dental caries, periodontal disease Bacterial diseases of digestive tract: enteric fever, cholera, bacillary dysentery		x	x	x	x	
				Microbial diseases of digestive system Fungal diseases: Mycotoxins production Viral diseases: Mumps, Gastroenteritis, Hepatitis		x	x	x	x	
									x	

				Microbial diseases of cardiovascular system Bacterial diseases: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral diseases: Yellow fever, Dengue fever		x	x	x	x	
				Diseases of urinary and reproductive system: Bacterial diseases: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid Fungal infections: Candidiasis Viral infections: Genital herpes, AIDS		x	x	x	x	

				Microbial diseases of nervous system Bacterial diseases: Bacterial meningitis, Tetanus, Botulism, leprosy Fungal diseases: cryptococcosis Viral diseases: Arthropod-borne encephalitis, Rabies, poliomyelitis		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
2.2	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from microbiology research in a specific and suitable form.	b1	Microbial diseases of skin:Bacterial diseases: Staphylococcal infections, Streptococcal infections	Textbooks, Scientific papers and self learning	x	x	x	x	
				Microbial diseases of skin:Bacterial diseases: Infections by Pseudomonas, Propionibacterium infections		x	x	x	x	

				Microbial diseases of skin:Viral diseases (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)		x	x	x	x	
				Microbial diseases of skin:Fungal diseases (Cutaneous mycoses, Candidiasis)		x	x	x	x	
				Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis		x	x	x	x	
				Microbial diseases of respiratory tract: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal infections: Blastomycosis, Histoplasmosis, Aspergilloses Viral infections: Common cold, influenza		x	x	x	x	

				Microbial disease of digestive system Bacterial diseases: Oral diseases; dental caries, periodontal disease Bacterial diseases of digestive tract: enteric fever, cholera, bacillary dysentery		x	x	x	x	
				Microbial diseases of digestive system Fungal diseases: Mycotoxins production Viral diseases: Mumps, Gastroenteritis, Hepatitis		x	x	x	x x	
				Microbial diseases of cardiovascular system Bacterial diseases: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral diseases: Yellow fever, Dengue fever		x	x	x	x	

2.4	2.4.2 Effectively use information technology in professional practices	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	d1	Diseases of urinary and reproductive system: Bacterial diseases: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid Fungal infections: Candidiasis Viral infections: Genital herpes, AIDS		x	x	x	x	
				Microbial diseases of nervous system Bacterial diseases: Bacterial meningitis, Tetanus, Botulism, leprosy Fungal diseases: cryptococcosis Viral diseases: Arthropod-borne encephalitis, Rabies, poliomyelitis		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
				Activity	Textbooks, Scientific papers and self learning		x			x

	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of microbiology.	d2	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team.	d3	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.8- Continuous and self learning.	D.8- Study independently for continuous self learning and plan research studies.	d4	Activity	Textbooks, Scientific papers and self learning		x			x

Thesis Specification

Thesis of Master Degree

A- Thesis specifications:

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

1- Basic information:

Title: Master Thesis in Microbiology
Credit hours: 30 hrs

2- Overall aim of the thesis:

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

- Collect all the data needed to answer the research question using the developed study design
- Identify and perform different techniques and methods used in the experimental work according to the designed protocol
- 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):

Knowledge and Understanding	
a1	Explain the theoretical and advanced bases of microbiology and their related subjects that related to main objectives of the thesis
a2	Determine the problem the thesis will handle in correlation with the community and surrounding environment
a3	Outline up-to-date development in different microbiological and biotechnology techniques.
a4	Understand any legal aspects related to the thesis work.
a5	Demonstrate GLP and quality assurance related to practical work of the thesis
a6	Identify and apply scientific experimental ethics.
Intellectual skills	
b1	Discuss problems related to practical work by obtained quantitative data from the practical work
b2	Outline professional problems and suggest solutions relay on different microbiological knowledge and recent information
b3	Combine required specialties to manage the subject under study
b4	Integrate scientific results and write report following conducting research
b5	Manage risks and hazards related to professional practical area
b6	Design a laboratory protocol for the work
b7	Decide what to do with full responsibility in scientific research
Professional and practical skills	
c1	Perform practical work and apply different techniques relative to experimental design.
c2	Use and evaluate practical data to write report
c3	Apply various microbiological techniques and analysis that involved in the protocol
General and Transferable skills	
d1	Communicate effectively with all people related to the work
d2	Use information technology in review and thesis preparation
d3	Evaluate the work and learning needs

d4	Use various sources to get information about the subject understudy
d5	Set rules for evaluation and judging others performance.
d6	Work effectively as a member of a team
d7	Acquire time management skills
d8	Study independently and plan research studies.

4. Thesis Content:

Steps	Content
1st	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. Collect all available information about this subject by all possible means. Use internet, journals, books and others thesis to get previous and recent information about the subject understudy. Design the protocol including the steps of work following the suitable timetable. Increase the awareness of the recent microbiological issues and techniques that will be used during practical work and determined by the protocol. Integrate different knowledge (microbiology, pharmacological knowledge, biostatistics, histology ……..) to solve suggested problem. Continuous evaluation to the thesis outcome according to the schedule.
2nd	Identify different practical techniques and methods to assess microbiological parameters related to the subject under study.

	Operate scientific instruments according to instructions. Evaluate and manage hazards (chemical and biological) throughout the whole practical work. Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments). Perform tissue culturing of different types of microorganisms in variety of cultural media. Separate biological samples and tissues (e.g. blood, plasma, ……). Apply ethical recommendations during dealing with experimental animals. Understand any legal aspects related to the thesis work.
3rd	Collect raw data for the tested microbiological parameters. Interpret raw data to get valuable information. Perform statistical analysis and biological correlation for the results. Present and describe the results graphically. Suggest solution to the problem understudy based on this presented data.
4th	Communicate with supervisors to discuss results and with patients to collect case history and samples. Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians). Present the results periodically in seminars. Write scientific reports on the obtained results with conclusive significance.

	Discuss obtained results in comparison with pervious literatures. Suggest possible recommendations based on the outcome of the thesis and decide future plans. Summarize the thesis in an understandable Arabic language for non professionals. Write references in the required form (Thesis, Paper…….). Demonstrate the thesis in a final power point presentation. Continue self-learning throughout the experimental work and writing scientific papers.

5- Teaching and Learning Methods:

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

6- References:

- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for:

1. **For practical work:** U.V spectrophotometer, centrifuge, ELISA, Electrophoresis, Electronic Microscope, Light microscope, Laminar air flow, incubator, autoclave, lyophilizer, loops, swabs, bacterial dyes, swabs, microbial culture media, chemicals

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- **Head of Department: Prof. Dr. Hemmat Kamal Abdellatif**

	Master Thesis (Microbiology)			
	NARS	**Program ILOs**	**Thesis ILOs**	**Thesis content**
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Express properly the theories and principles of microbiology and their related subjects including molecular biology, biotechnology, clinical microbiology and pharmaceutical microbiology.	Explain the theoretical and advanced bases of microbiology and their related subjects that related to main objectives of the thesis	• Collect all available information about this subject by all possible means.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2-Outline the influence of microbiology branches on the environment	Determine the problem the thesis will handle in correlation with the community and surrounding environment	• 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.
	2.1.3- Scientific developments in the area of specialization.	A.3- Illustrate the developments in the field of biotechnology and genetics and their applications	Outline up-to-date development in different microbiological and biotechnology techniques.	•Increase the awareness of the recent microbiological issues and techniques that will be used during practical work and determined by the protocol.
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.4- Understand the moral and legal principles for professional practices in microbiology.	Understand any legal aspects related to the thesis work.	• Understand any legal aspects related to the thesis work.
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.	Demonstrate GLP and quality assurance related to practical work of the thesis	• Identify different practical techniques and methods to assess microbiological parameters related to the subject under study. • Operate scientific instruments according to instructions.
	2.1.6- The fundamentals and ethics of scientific research.	A.6- Demonstrate full awareness of ethics in all aspects of scientific	Identify and apply scientific experimental ethics.	• Apply ethical recommendations during dealing with experimental animals.

		research.		
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from microbiology research in a specific and suitable form.	Discuss problems related to practical work by obtained quantitative data from the practical work	•Collect raw data for the tested microbiological parameters. • Interpret raw data to get valuable information. • Perform statistical analysis and biological correlation for the results. • Present and describe the results graphically. • Suggest solution to the problem understudy based on this presented data.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Suggest significant solutions for problems discovered in microbiological results based on a wide academic background.	Outline professional problems and suggest solutions relay on different microbiological knowledge and recent information	• Discuss obtained results in comparison with pervious literatures. • Suggest possible recommendations based on the outcome of the thesis and decide future plans.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Acquire the needed pharmaceutical knowledge to manage professional problems in microbiological researches.	Combine required specialties to manage the subject under study	• Integrate different knowledge (microbiology, pharmacological knowledge, biostatistics, histology ……..) to solve suggested problem.
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research and write scientific reports on the obtained results of research.	Integrate scientific results and write report following conducting research	• Write scientific reports on the obtained results with conclusive significance.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Recognize possible hazards during work and how to deal with them effectively.	Manage risks and hazards related to professional practical area	Evaluate and manage hazards(chemical and biological) throughout the whole practical work.

	2.2.6- Plan to improve performance in the field of specialization.	B.6- Design an effective laboratory protocol for the research to improve the performance.	Design a laboratory protocol for the work	• Design the protocol including the steps of work following the suitable timetable.
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in different issues during research.	Decide what to do with full responsibility in scientific research	•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. Suggest possible recommendations based on the outcome of the thesis and decide future plans.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Understand the basic and recent laboratory techniques in microbiological research.	Perform practical work and apply different techniques relative to experimental design.	• Identify different practical techniques and methods to assess microbiological parameters related to the subject under study.
	2.3.2- Write and evaluate professional reports.	C.2- Write professional scientific reports in microbiological research and evaluate them.	Use and evaluate practical data to write report	• Summarize the thesis in an understandable Arabic language for non professionals. • Write references in the required form (Thesis, Paper…….).
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Conduct various methods and microbiological techniques of analysis and assure the quality and suitability of instruments.	Apply various microbilogical techniques and analysis that involved in the protocol	• Operate scientific instruments according to instructions. • Perform tissue culturing of different types of microorganisms in variety of cultural media. • Separate biological samples and tissues (e.g. blood, plasma, ……).

General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Interact effectively with patients and microbiology professionals.	Communicate effectively with all people related to the work	• Communicate with supervisors to discuss results and with patients to collect case history and samples.
	2.4.2- Effectively use information technology in professional practices	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	Use information technology in review and thesis preparation	• Present the results periodically in seminars • Demonstrate the thesis in a final power point presentation.
	2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment of learning needs in the field of microbiology.	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- Retrieve information from various sources in the field of microbiology.	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- Set criteria for evaluating others performance in the field of microbiology and its different branches.	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 effectively as a member of team.	Work effectively as a member of a team	• Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians).
	2.4.7- Manage time effectively.	D.7- Get maximum use of time to achieve goals.	Acquire time management skills	· Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments).
	2.4.8- Continuous and self learning.	D.8- Study independently for continuous self learning and plan research studies.	Study independently and plan research studies.	• Continue self-learning throughout the experimental work and writing scientific papers.

PhD Degree

Program Specification

Program Specification

A- Basic Information

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

2- Program type: Monodisciplinary.

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

4- Department: Microbiology

5- Coordinator: Prof. Dr. Fathy Serry

6- Date of program specification approval: 2012

B- Professional Information

1- Program aims:

The Microbiology PhD program provides continuing professional development opportunities related to particular professions or employment setting.

2-Intended Learning Outcomes (ILOs):

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

2-1- Knowledge and Understanding :

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

A.1- Express properly the theories and principles of microbiology and their related subjects including diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms

A.2-Recognize the methods, techniques, tools and ethics of scientific research.

A.3- Understand the ethical and legal principles for professional practices in microbiology.

A.4-Describe the principles of quality assurance of different antimicrobial agents using microorganisms.

A.5- Outline the influence of microbiology branches such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the environment.

2-2 - Intellectual Skills:

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

B.1- Analyze and interpret data obtained from microbiology research and utilize them in a specific and suitable form.

B.2- Suggest significant solutions for problems discovered in microbiological results based on a wide academic background and the available information.

B.3- Conduct research studies to increase and extend the current knowledge.

B.4- Write scientific reports and formulate scientific papers on the obtained results of research.

B.5-Recognize possible hazards during work and how to deal with them effectively.

B.6- Design an effective laboratory protocol for the research to improve the performance in work.

B.7- Take professional decisions in different issues during research.

B.8- Develop knowledge to be creative and innovative.

B.9- Manage discussions based on logical evidence.

2-3 - Professional and Practical Skills:

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

C.1- Understand the basic and recent laboratory techniques in microbiological research.

C.2- Write professional scientific reports in microbiological research and evaluate them.

C.3- Develop various microbiological techniques and methods and assure the quality and suitability of instruments and tools.

C.4- Use efficiently the information technology to improve the professional practice.

C.5- Practice self assessment and assessment of others performance to improve the whole performance.

2-4 - General and Transferable Skills:

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

D.1- Interact effectively with patients and microbiology professionals.

D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.

D.3- Set criteria for evaluating others performance in the field of microbiology and its different branches.

D.4- Practice self assessment for continuous learning.

D.5- Retrieve information from various sources in the field of microbiology.

D.6- Work effectively as a member of team.

D.7- Manage scientific meetings and get maximum use of time to achieve goals.

3- Academic Standards:

- NARS (National Academic Reference Standards)

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

	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- Express properly the theories and principles of microbiology and their related subjects including diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2-Recognize the methods, techniques, tools and ethics of scientific research.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.3- Understand the ethical and legal principles for professional practices in microbiology.
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4-Describe the principles of quality assurance of different antimicrobial agents using microorganisms.
	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.5- Outline the influence of microbiology branches such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the environment

Intellectual Skills	2.2.1- Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B.1- Analyze and interpret data obtained from microbiology research and utilize them in a specific and suitable form.
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest significant solutions for problems discovered in microbiological results based on a wide academic background and the available information.
	2.2.3- Conduct research studies that add to the current knowledge.	B.3- Conduct research studies to increase and extend the current knowledge
	2.2.4- Formulate scientific papers.	B.4- Write scientific reports and formulate scientific papers on the obtained results of research.
	2.2.5- Assess hazards and risks in professional practice in his / her area of specialization.	B.5-Recognize possible hazards during work and how to deal with them effectively.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.6- Design an effective laboratory protocol for the research to improve the performance in work.
	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.7- Take professional decisions in different issues during research.

	2.2.8- Be creative and innovative.	B.8- Develop knowledge to be creative and innovative.
	2.2.9- Manage discussions and arguments based on evidence and logic.	B.9- Manage discussions based on logical evidence.
Professional and Practical Skills	2.3.1- Mastery of basic and modern professional skills in the area of specialization.	C.1- Understand the basic and recent laboratory techniques in microbiological research.
	2.3.2- Write and critically evaluate professional reports.	C.2- Write professional scientific reports in microbiological research and evaluate them.
	2.3.3- Evaluate and develop methods and tools existing in the area of specialization.	C.3- Develop various microbiological techniques and methods and assure the quality and suitability of instruments and tools.
	2.3.4- Properly use technological means in a better professional practice.	C.4- Use efficiently the information technology to improve the professional practice.
	2.3.5- Plan to improve professional practices and to improve the performance of other scholars.	C.5- Practice self assessment and assessment of others performance to improve the whole performance.
General and Transferable Skills	2.4.1- Effective communication in its different forms.	D.1- Interact effectively with patients and microbiology professionals.

	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
	2.4.3- Help others to learn and evaluate their performance.	D.3- Set criteria for evaluating others performance in the field of microbiology and its different branches
	2.4.4- Self- assessment and continuous learning.	D.4- Practice self assessment for continuous learning.
	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve information from various sources in the field of microbiology.
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Manage scientific meetings and get maximum use of time to achieve goals.

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:		
Isp4	ygoloiborciM citsongaiD	4	A1, A5, B1, D2, D4, D6, D7
Isp5	Molecular and Traditional Typing of Microorganisms	4	A1, A2, A5, B7, D2, D4, D5, D6, D7
Isp6	Pathogenic Bacteriology	4	A1, A4, A5, B1, D2, D4, D5, D6, D7

	Thesis	30	A1, A2, A3, A4, A5, B1, B2, B3, B4, B5, B6, B7, B8, B9, C1, C2, C3,C4, C5, D1, D2, D3, D4, D5, D6 and D7

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
	Professional and practical Skills & General and

Follow up	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
Internal evaluator: Professor Dr. Fathy Serry	Program evaluation Courses	Program report Courses report

	evaluation	
External evaluator: Assistant Professor. Ramadan El-Domany	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator **Head of Department**

Prof. Dr. Fathy Serry **Prof. Dr. Hemmat Kamal**

Diagnostic Microbiology

Course Specification of Diagnostic Microbiology

Course specifications:

- **Program on which the course is given:** PhD Pharm Sci (Microbiology).
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology
- **Date of specification approval:** 2012/2013

1-Basic Information:

Title: Diagnostic Microbiology Code: Isp4
Credit hours: 4hrs/week Lectures: 4hrs/week
Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to describe in detailed the features of common microbial pathogens and the mechanisms of pathogenesis, describe the taxonomic classification of pathogenic microorganisms and describe all diagnostic approaches and tests to needed to specify and diagnose microorganism.

3-Intended learning outcomes (ILOS) of Diagnostic Microbiology:

A-Knowledge and Understanding	
a1	Recognize the detailed essential features of different types of microorganisms, their mechanisms of resistance and the diagnostic methods for their infections.
a2	Demonstrate in depth knowledge of systematic and classification for microorganisms
a3	Illustrate the effect of diagnostic microbiology on the environment
B- Intellectual skills	
b1	Analyze and interpret data obtained from diagnostic microbiology research in a specific and suitable form
D- General and Transferable Skills	
d1	Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
d2	Practice self assessment for continuous learning.
d3	Work effectively as a member of team.
d4	Manage scientific meetings and get maximum use of time to achieve goals.

4-Course content of Diagnostic Microbiology:

Week	Lecture content (4 hrs/week)
1st	Basic bacteriological concepts of virulence and technologic advances in clinical microbiology.
2nd	Taxonomy: classification, nomenclature, and identification of bacteria.
3rd	Basic bacterial anatomy and physiology, bacterial virulence and pathogenicity, and technologic advances in clinical microbiology, immunologic methods
4th	The role of microbiology laboratory in the diagnosis of infectious diseases
5th	Guidelines for collection, transport, processing, analysis and reporting of cultures from specific specimen sources.
6th	The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.
7th	Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.
8th	Activity
9th	The Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.The aerobic Gram+ve bacilli, The anaerobic bacteria
10th	Mycoplasma and ureaplasma, Myxobacteria
11th	Spirochaetal infections
12th	Mycology and Parasitology
13th	Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.
14th	Revision
15th	Open discussion

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6-Student Assessment methods:

- Written exam to assess: a1, a2, a3, b1
- Oral exam to assess: a1, a2, a3, b1
- Activity to assess: d1, d2, d3, d4

Assessment schedule:

Assessment (1): Activity	Week 8
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 %
TOTAL	**100**	**100%**

7-Rreferences &books

A – Scientific papers

B- Essential Books

- Elmer W. Koneman, Stephen D. Allen, William M. Janda, Paul C. Schreckenberger, Washington C. Winn. Color Atlas and Textbook of Diagnostic Microbiology, 5th edition.Lippincott, 1996.
- Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 5th ed. (Philadelphia: Elsevier/Mosby, 2005).
- Levinson, W. Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill, 2006).

C -Suggested Books

1. Brooks, G.F.; Carroll, K. C.; Butel, J.S.; Morse, S. A. (2007): Jawetz, Melnick and Adelberg's Medical Microbiology. 24th ed. McGraw-Hill.
2. Infectious Disease: A Clinical Short Course by F.S. Southwick, McGraw-Hill, 2007.

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Eman Mahmoud Hassan El-Masry**
- **Head of Department: Prof Dr/ Hemmat Kamal Abdellatif**
- **Date:**

Matrix I of Diagnostic microbiology (2012-2013)

Course Contents		ILOs of Diagnostic Microbiology course							
		Knowledge and understanding			Intellectual skills	General and transferable skills			
		a1	a2	a3	b1	d1	d2 d3	d4	
1	Basic bacteriological concepts of virulence and technologic advances in clinical microbiology.	x	x						
2	Taxonomy: classification, nomenclature, and identification of bacteria.		x						
3	Basic bacterial anatomy and physiology, bacterial virulence and pathogenicity, and technologic advances in clinical microbiology, immunologic methods	x		x					
4	The role of microbiology laboratory in the diagnosis of infectious diseases	x		x					
5	Guidelines for collection, transport, processing, analysis and reporting of cultures from specific specimen sources.	x							
6	The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.	x		x	x				
7	Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.	x		x	x				
8	Activity	x		x	x	x	x x	x	
9	The Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.	x		x	x				
10	Mycoplasma and ureaplasma, Myxobacteria	x		x	x				

11	Spirochaetal infections	**x**		**x**	**x**				
12	Mycology and Parasitology	**x**		**x**	**x**				
13	Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.	**x**		**x**	**x**				
14	Revision	**x**	**x**	**x**	**x**				
15	Open discussion	**x**	**x**	**x**	**x**				

Matrix II of Diagnostic microbiology (2012-2013)

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	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- Express properly the theories and principles of microbiology and their related subjects including diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms	**a1**	Basic bacteriological concepts of virulence and technologic advances in clinical microbiology.	**Textbooks, Scientific papers and self learning**	x	x	x	x	
				Basic bacterial anatomy and physiology, bacterial virulence and pathogenicity, and technologic advances in clinical microbiology, immunologic methods		x	x	x	x	
				The role of microbiology laboratory in the diagnosis of infectious diseases		x	x	x	x	
				Guidelines for		x	x	x	x	

				collection, transport, processing, analysis and reporting of cultures from specific specimen sources.					x	
				The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.		x	x	x	x	
				Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.		x	x	x	x	
				The Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.		x	x	x	x	

				The aerobic Gram+ve bacilli, The anaerobic bacteria		x	x	x	x	
				Mycoplasma and ureaplasma, Myxobacteria		x	x	x	x	
									x	
				Spirochaetal infections		x	x	x	x	
				Mycology and Parasitology		x	x	x	x	
				Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
			a2	Basic bacteriological concepts of virulence and technologic advances in clinical microbiology.		x	x	x	x	
				Taxonomy: classification, nomenclature, and identification of bacteria.		x	x	x	x	
				Revision		x	x	x	x	

				Open discussion		x	x	x	x	
	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.5- Outline the influence of microbiology branches such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the environment	a3	Basic bacterial anatomy and physiology, bacterial virulence and pathogenicity, and technologic advances in clinical microbiology, immunologic methods	Textbooks, Scientific papers and self learning	x	x	x	x	
				The role of microbiology laboratory in the diagnosis of infectious diseases		x	x	x	x	
				The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.		x	x	x	x	
				Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species		x	x	x	x	

				and Moraxella catarrhalis.						
				The Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.		x	x	x	x	
				The aerobic Gram+ve bacilli, The anaerobic bacteria		x	x	x	x	
				Mycoplasma and ureaplasma, Myxobacteria		x	x	x	x	
				Spirochaetal infections		x	x	x	x	
				Mycology and Parasitology		x	x	x	x	
				Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.		x	x	x	x	

				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
2.2	2.2.1- Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B.1- Analyze and interpret data obtained from microbiology research and utilize them in a specific and suitable form.	b1	The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.	Textbooks, Scientific papers and self learning	x	x	x	x	
				Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.		x	x	x	x	
				The Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.		x	x	x	x	

				The aerobic Gram+ve bacilli, The anaerobic bacteria		x	x	x	x	
				Mycoplasma and ureaplasma, Myxobacteria		x	x	x	x	
				Spirochaetal infections		x	x	x	x	
				Mycology and Parasitology		x	x	x	x	
				Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
2.4	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.4- Self-assessment and continuous learning.	D.4- Practice self assessment for continuous	d2	Activity	Textbooks, Scientific papers and		x			

		learning.			self learning					x
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.	d3	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.7- Direct scientific meetings and to manage time effectively	D.7- Manage scientific meetings and get maximum use of time to achieve goals	d4	Activity	Textbooks, Scientific papers and self learning		x			x

Molecular and Traditional Typing of Microorganisms

Course Specifications of Molecular and Traditional Typing of Microorganisms

Course specifications:

- **Program on which the course is given:** PhD Pharm Sci
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology
- **Date of specification approval:** 2012/2013

1-Basic Information:

Title: Molecular and Traditional Typing of Microorganisms
Code: Isp5
Credit hours: 4hrs/week Lectures: 4hrs/week
Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to enumerate, describe the methods for classification of microorganism and explain the rationale behind it, identify different types of microorganisms to species level, discriminate closely related strains of microorganisms and describe the diagnostic and discriminative criteria for identification and typing of different genera, species, and strains of microorganisms.

3-Intended learning outcomes (ILOS) of Molecular and Traditional Typing of Microorganisms:

A-Knowledge and Understanding	
a1	Enumerate and describe the methods for classification of microorganisms, identify different types of microorganisms to species level and discriminate closely related strains of microorganisms.
a2	Describe the diagnostic and discriminative criteria for identification and typing of different genera, species, and strains of microorganisms and determine the relatedness between different microbial strains.
a3	Describe the impact of typing in epidemiology, and epidemiologic investigations
B- Intellectual skills	
b1	Take professional decisions in evaluation of the degree of relatedness between various strains of same microbial species.
D- General and Transferable Skills	
d1	Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
d2	Practice self assessment for continuous learning.
d3	Retrieve information from various sources in the field of microbiology.
d4	Work effectively as a member of team.
d5	Manage scientific meetings and get maximum use of time to achieve goals.

4-Course content Molecular and Traditional Typing of Microorganisms:

Week number	Lecture content (4hrs/week)
1	Microbial Taxonomy: Definition, Nomenclatural rules and identification, Hierarchical organization and the position of microbes in the living world.
2	Recent trends in microbial taxonomy- Morphological, Physiological, Metabolic, Genetic and Molecular characteristics used in taxonomy. Numerical and chemotaxonomy of microorganisms, phylogenetic tree- dendrogram. Classification of bacteria according to Bergey's Manual of Determinative Bacteriology (9th edition).
3	Traditional methods of typing: Phenotypic methods, biotyping, serotyping, Phage typing
4	Traditional methods of typing: antibiogram, resistogram and bacteriocin typing
5	Protein analysis: antigen agglutination, immunoassay, electrophoretic typing, non-denaturing electrophoresis, isoenzyme analysis Chromatographic analysis: short chain fatty acid GLC, & pyrolysis
6	Activity
7	Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,
8	Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting
9	Nucleic acid based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification
10	Nucleic acid based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA
11	Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.
12	Analysis of amplification product: hybridization protection assay (HPA),DNA enzyme immunoassay (DEIA), DNA sequencing, single-strand conformational polymorphism (SSCP)

13	Application of identification and typing methods
14	Revision
15	Open discussion

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6-Student Assessment methods:

- Written exam to assess: a1, a2, a3, b1
- Oral exam to assess: a1, a2, a3, b1
- Activity to assess: d1, d2, d3, d4, d5

Assessment schedule:

Assessment (1): Activity	Week 6
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 %
TOTAL	**100**	**100%**

7-Rreferences &books

A –Scientific papers

B- Essential books

- Elmer W. Koneman, Stephen D. Allen, William M. Janda, Paul C. Schreckenberger, Washington C. Winn. Color Atlas and Textbook of Diagnostic Microbiology, 5th edition.Lippincott, 1996.
- Holt. J.S., Kreig, N.R., Sneath, P.H.A and Williams, S.T. 1994. Bergey's Manual of Determinative Bacteriology (9th Edition), Williams and Wilkins, Baltimore.

- Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 5th ed. (Philadelphia: Elsevier/Mosby, 2005).
- Levinson, W. Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill, 2006).

C -Suggested books

- Brooks, G.F.; Carroll, K. C.; Butel, J.S.; Morse, S. A. (2007): Jawetz, Melnick and Adelberg's Medical Microbiology. 24th ed. McGraw-Hill.
- Infectious Disease: A Clinical Short Course by F.S. Southwick, McGraw-Hill, 2007.

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Fathy Mohammed El-Sayed Serry**
- **Head of Department: Prof Dr/ Hemmat Kamal Abdellatif**
- **Date:**

Matrix I of Molecular and traditional typing of microorganisms (2012-2013)

Course Contents		ILOs of Molecular and traditional typing of microorganisms course								
		Knowledge and understanding			Intellectual skills	General and transferable skills				
		a1	a2	a3	b1	d1	d2	d3	d4	d5
1	Microbial Taxonomy: Definition, Nomenclatural rules and identification, Hierarchical organization and the position of microbes in the living world.	x								
2	Recent trends in microbial taxonomy-Morphological, Physiological, Metabolic, Genetic and Molecular characteristics used in taxonomy. Numerical and chemotaxonomy of microorganisms, phylogenetic tree-dendrogram. Classification of bacteria according to Bergey's Manual of Determinative Bacteriology (9th edition).	x								
3	Traditional methods of typing: Phenotypic methods, biotyping, serotyping, Phage typing	x								
4	Traditional methods of typing: antibiogram, resistogram and bacteriocin typing	x								
5	Protein analysis: antigen agglutination, immunoassay, electrophoretic typing, non-denaturing electrophoresis, isoenzyme analysis Chromatographic analysis: short chain fatty acid GLC, & pyrolysis	x	x	x	x					
6	Activity					x	x	x	x	x

7	Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,	**x**	**x**	**x**	**x**					
8	Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting	**x**	**x**	**x**	**x**					
9	Nucleic acid based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification	**x**	**x**	**x**	**x**					
10	Nucleic acid based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA	**x**	**x**	**x**	**x**					
11	Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.	**x**	**x**	**x**	**x**					
12	Analysis of amplification product: hybridization protection assay (HPA),DNA enzyme immunoassay (DEIA), DNA sequencing, single-strand conformational polymorphism (SSCP)	**x**	**x**	**x**	**x**					
13	Application of identification and typing methods	**x**	**x**	**x**	**x**					
14	Revision	**x**	**x**	**x**	**x**					
15	Open discussion	**x**	**x**	**x**	**x**					

Matrix II of Molecular and traditional typing of microorganisms (2012-2013)

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	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- Express properly the theories and principles of microbiology and their related subjects including diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms	a1	Microbial Taxonomy: Definition, Nomenclatural rules and identification, Hierarchical organization and the position of microbes in the living world.	Textbooks, Scientific papers and self learning	x	x	x	x	
				Recent trends in microbial taxonomy- Morphological, Physiological, Metabolic, Genetic and Molecular characteristics used in taxonomy. Numerical and chemotaxonomy of microorganisms, phylogenetic tree-dendrogram. Classification of bacteria according to Bergey's Manual of Determinative Bacteriology (9th edition).		x	x	x	x	
				Traditional methods of typing: Phenotypic methods, biotyping, serotyping, Phage typing		x	x	x	x	

				Traditional methods of typing: antibiogram, resistogram and bacteriocin typing		x	x	x	x	
				Protein analysis: antigen agglutination, immunoassay, electrophoretic typing, non-denaturing electrophoresis, isoenzyme analysis Chromatographic analysis: short chain fatty acid GLC, & pyrolysis		x	x	x	x	
						x	x	x	x	
				Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,		x	x	x	x	
				Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting		x	x	x	x	
				Nucleic acid based typing systems by hybridization methods, nucleic acid probes,		x	x	x	x	

				branched DNA signal amplification						
				Nucleic acid based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA		x	x	x	x	
				Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.		x	x	x	x	
				Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.		x	x	x	x	
				Application of identification and typing methods		x	x	x	x	

				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2-Recognize the methods, techniques, tools and ethics of scientific research.	a2	Protein analysis: antigen agglutination, immunoassay, electrophoretic typing, non-denaturing electrophoresis, isoenzyme analysis Chromatographic analysis: short chain fatty acid GLC, & pyrolysis	Textbooks, Scientific papers and self learning	x	x	x	x	
				Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,					x	
				Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting		x	x	x	x	

				Nucleic acid based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification		x	x	x	x	
				Nucleic acid based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.		x	x	x	x	
				Analysis of amplification product: hybridization protection assay (HPA),DNA enzyme immunoassay (DEIA), DNA sequencing, single-strand conformational polymorphism (SSCP)		x	x	x	x	

				Application of identification and typing methods		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
				Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,		x	x	x	x	
	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.5- Outline the influence of microbiology branches such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the environment	a3	Protein analysis: antigen agglutination, immunoassay, electrophoretic typing, non-denaturing electrophoresis, isoenzyme analysis Chromatographic analysis: short chain fatty acid GLC, & pyrolysis	Textbooks, Scientific papers and self learning	x	x	x	x	

				Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,		x	x	x	x	
				Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting		x	x	x	x	
				Nucleic acid based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification		x	x	x	x	
				Nucleic acid based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA		x	x	x	x	

				Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.		x	x	x	x	
				Analysis of amplification product: hybridization protection assay (HPA),DNA enzyme immunoassay (DEIA), DNA sequencing, single-strand conformational polymorphism (SSCP)		x	x	x	x	
				Application of identification and typing methods		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	

2.2	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.7- Take professional decisions in different issues during research.	b1	Protein analysis: antigen agglutination, immunoassay, electrophoretic typing, non-denaturing electrophoresis, isoenzyme analysis Chromatographic analysis: short chain fatty acid GLC, & pyrolysis	Textbooks, Scientific papers and self learning	x	x	x	x	
				Nucleic acid based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,		x	x	x	x	
				Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting		x	x	x	x	
				Nucleic acid based typing systems by hybridization methods, nucleic acid probes, branched DNA signal		x	x	x	x	

				amplification						
				Nucleic acid based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA		x	x	x	x	
				Other nucleic acid amplification techniques: transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.		x	x	x	x	
				Analysis of amplification product: hybridization protection assay (HPA),DNA enzyme immunoassay (DEIA), DNA sequencing, single-strand conformational polymorphism (SSCP)		x	x	x	x	

				Application of identification and typing methods		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
2.4	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.4- Self-assessment and continuous learning.	D.4- Practice self assessment for continuous learning.	d2	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve information from various sources in the field of microbiology.	d3	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.6- Work as a member	D.6- Work effectively as a	d4	Activity	Textbooks, Scientific papers and		x			x

	and lead a team of workers.	member of team.			self learning					
	2.4.7- Direct scientific meetings and to manage time effectively	D.7- Manage scientific meetings and get maximum use of time to achieve goals	d5	Activity	Textbooks, Scientific papers and self learning		x			x

Pathogenic Bacteriology

Course Specifications of Pathogenic Bacteriology

Course specifications:

- **Program on which the course is given:** PhD Pharmaceutical Sciences
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology
- **Date of specification approval:** 2012/2013

1- Basic Information:

Title: Advanced Pathogenic Bacteriology Code: Isp6
Credit hours: 4hrs/week
Lectures: 4hrs/week
Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to identify the attributes of bacterial pathogens and virulence factors that enable them to evade host defenses, recognize the genetic and molecular regulation of virulence factors and its interaction with the host and describe the new and up to date emerging pathogens and their characteristics.

3-Intended learning outcomes (ILOS) of Advanced Pathogenic Bacteriology:

A-Knowledge and Understanding	
a1	Recognize the bacterial pathogens, their virulence factors and genetic determinants and identify the cell component of potential immunogenic and therapeutic values
a2	Describe the resistance of pathogen to drugs
a3	Outline the effect of pathogenic bacteriology on the environment
B- Intellectual skills	
b1	Analyze and interpret data obtained from pathogenicity research in a specific and suitable form
D- General and Transferable Skills	
d1	Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
d2	Practice self assessment for continuous learning.
d3	Retrieve information from various sources in the field of microbiology.
d4	Work effectively as a member of team.
d5	Manage scientific meetings and get maximum use of time to achieve goals.

4-Course contents of Advanced Pathogenic Bacteriology:

Week	Lecture content (4 hours/week)
1st	Biochemical basis of host and tissue specificity
2nd	Role of iron in bacterial infection
3rd	Attachment and adherence of pathogenic bacteria to the host cell
4th	The survival of bacteria within phagocytes
5th	Role of indigenous microflora of the gastrointestinal in resistance to the infectious disease.
6th	Determinants of virulence in anaerobic bacteria Plasmids and genetic determinants which contribute to the bacteria pathogenicity
7th	Activity

8th	Genetic regulation and mechanisms of natural resistance to infectious diseases.
9th	Tissue injury by bacterial pathogens: exotoxins, endotoxins and non-specific immunity
10th	Organisms of medical interest
11th	Some major exotoxins
12th	Novel and emerging bacterial pathogens
13th	Drug resistance pathogens
14th	Revision
15th	Open discussion

5-Teaching and Learning Methods:

- Lectures (overhead project, data show, board)
- Self learning (internet search.....)

6-Student Assessment methods:

- Written exam to assess: a1, a2, a3, b1
- Oral exam to assess: a1, a2, a3, b1
- Activity to assess: d1, d2, d3, d4, d5

Assessment schedule:

Assessment (1): Activity	Week 7
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 %
TOTAL	**100**	**100%**

7-Rreferences &books:

A – Handouts.

B- Essential books

- Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 5th ed. (Philadelphia: Elsevier/Mosby, 2005).
- Levinson, W. Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill, 2006).
- Brooks, G.F.; Carroll, K. C.; Butel, J.S.; Morse, S. A. (2007): Jawetz, Melnick and Adelberg's Medical Microbiology. 24th ed. McGraw-Hill.
- Infectious Disease: A Clinical Short Course by F.S. Southwick, McGraw-Hill, 2007.
- Cappuccino and James, G (1996), Microbiology a laboratory manual, Addison Wesley Publishing Company Inc. 4th edition, England, California.
- Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (1994), Methods of General and Molecular Bacteriology, Ed. American Society for Microbiology, Washington D.C.
- Topley & Wilson's (1995). Text Book on principles of Bacteriology, Virology and Immunology IX Edition, Edward Arnold, London.
- Jawets B, Melmick, J.L and Adelberg, E.A, 1987. Review of Medical Microbiology, 17th ed. Appleton and Langa, California.

C- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Hemmat Kamal Abdellatif**
- **Head of Department: Prof Dr/ Hemmat Kamal Abdellatif**
- **Date:**

Matrix I of Pathogenic bacteriology (2012-2013)

Course Contents		ILOs of Pathogenic bacteriology course									
		Knowledge and understanding			Intellectual skills	General and transferable skills					
		a1	a2	a3	b1	d1	d2	d3	d4	d5	
1	Biochemical basis of host and tissue specificity	x									
2	Role of iron in bacterial infection	x									
3	Attachment and adherence of pathogenic bacteria to the host cell	x		x							
4	The survival of bacteria within phagocytes	x		x							
5	Role of indigenous microflora of the gastrointestinal in resistance to the infectious disease.	x		x							
6	Determinants of virulence in anaerobic bacteria Plasmids and genetic determinants which contribute to the bacteria pathogenicity	x		x							
7	Activity					x	x	x	x	x	
8	Genetic regulation and mechanisms of natural resistance to infectious diseases.	x		x							
9	Tissue injury by bacterial pathogens: exotoxins, endotoxins and non-specific immunity	x		x							
10	Organisms of medical interest	x		x	x						
11	Some major exotoxins	x		x	x						
12	Novel and emerging bacterial pathogens	x		x	x						
13	Drug resistance pathogens	x	x	x	x						
14	Revision	x	x	x	x						
15	Open discussion	x	x	x	x						

Matrix of Pathogenic bacteriology for 2012-2013

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	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- Express properly the theories and principles of microbiology and their related subjects including diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms	**a1**	Biochemical basis of host and tissue specificity	Textbooks, Scientific papers and self learning	x	x	x	x	
				Role of iron in bacterial infection		x	x	x	x	
				Attachment and adherence of pathogenic bacteria to the host cell		x	x	x	x	
				The survival of bacteria within phagocytes		x	x	x	x	
				Role of indigenous microflora of the gastrointestinal in resistance to the infectious disease.		x	x	x	x	
									x	
				Determinants of virulence in anaerobic bacteria		x	x	x	x	

				Plasmids and genetic determinants which contribute to the bacteria pathogenicity		x	x	x	x	
				Genetic regulation and mechanisms of natural resistance to infectious diseases.		x	x	x	x	
				Tissue injury by bacterial pathogens: exotoxins, endotoxins and non-specific immunity		x	x	x	x	
				Organisms of medical interest		x	x	x	x	
									x	
				Some major exotoxins		x	x	x	x	
				Novel and emerging bacterial pathogens		x	x	x	x	
				Drug resistance pathogens		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4-Describe the principles of quality assurance of different antimicrobial agents using microorganisms.	a2	Drug resistance pathogens	Textbooks, Scientific papers and self learning	x	x	x	x	
				Revision		x	x	x	x	

				Open discussion		x	x	x	x	
	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.5- Outline the influence of microbiology branches such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the environment	a3	Attachment and adherence of pathogenic bacteria to the host cell	Textbooks, Scientific papers and self learning	x	x	x	x	
				The survival of bacteria within phagocytes		x	x	x	x	
				Role of indigenous microflora of the gastrointestinal in resistance to the infectious disease.		x	x	x	x	
				Determinants of virulence in anaerobic bacteria		x	x	x	x	
				Plasmids and genetic determinants which contribute to the bacteria pathogenicity		x	x	x	x	
				Genetic regulation and mechanisms of natural resistance to infectious diseases.		x	x	x	x	

				Tissue injury by bacterial pathogens: exotoxins, endotoxins and non-specific immunity		x	x	x	x	
				Organisms of medical interest		x	x	x	x	
				Some major exotoxins		x	x	x	x	
				Novel and emerging bacterial pathogens		x	x	x	x	
				Drug resistance pathogens		x	x	x	x	
				Revision		x	x	x	x	
				Open discussion		x	x	x	x	
	2.2.1- Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B.1- Analyze and interpret data obtained from microbiology research and utilize them in a specific and suitable form.	b1	Organisms of medical interest		x	x	x	x	
2.2				Some major exotoxins		x	x	x	x	

				Novel and emerging bacterial pathogens		x	x	x	x	
				Drug resistance pathogens		x	x	x	x	
				Open discussion		x	x	x	x	
2.4	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity	Textbooks, Scientific papers and self learning					x
	2.4.4- Self-assessment and continuous learning.	D.4- Practice self assessment for continuous learning.	d2	Activity						x

	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve information from various sources in the field of microbiology.	d3	Activity						x
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.	d4	Activity						x
	2.4.7- Direct scientific meetings and to manage time effectively	D.7- Manage scientific meetings and get maximum use of time to achieve goals	d5	Activity						x

Thesis Specification

Thesis of PhD Degree

A- Thesis specifications:

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

1- Basic information:

Title: PhD Thesis in Microbiology
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.

3- Intended learning outcome's (ILOs):

Knowledge and Understanding	
a1	Demonstrate fundamentals and advanced bases of microbiology and its aspects related to main objectives of the thesis
a2	Identify recent techniques, methods in microbiological work as well as ethics of scientific research
a3	Understand the legal aspects of for professional and academic practices
a4	Define GLP and quality assurance bases related to practical work of the thesis
a5	Illustrate the outcomes of the research on the environment
Intellectual skills	
b1	Outline obstacles related to practical work by obtained data from the practical work
b2	Discuss professional problems and suggest solutions relay on different microbiological and pharmaceutical knowledge and recent information
b3	Plan a research in the field of microbiology and biotechnology .
b4	Integrate scientific results and write report following conducting research
b5	Manage risks and hazards related to professional practical area
b6	Apply GLP principles in research to develop laboratory performance
b7	Decide what to do with full responsibility in scientific research
b8	Illustrate creativity and innovation in modifying techniques and in utilization of various therapy.
b9	Manage evidence based arguments in the field of Microbiology.
Professional and practical skills	
c1	Apply and perform different techniques related to practical thesis work.
c2	Use and evaluate practical data to write report
c3	Estimate laboratory techniques used in microbiology and genetics lab. Develop methods of assay of various parameters.
c4	Apply technology in methodology development during practical

	work.
c5	Modify laboratory techniques.
General and Transferable skills	
d1	Interact with health care professional.
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 Microbiology
d5	Reprocess up-to-date information in Microbiology.
d6	Implement tasks as a member of a team.
d7	Utilize time effectively to achieve goals

4. Thesis Content:

Steps	Content
1st	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. Collect all available information about this subject by all possible means. Use internet, journals, books and others thesis to get previous and recent information about the subject understudy. Design the protocol including the steps of work following the suitable timetable. Increase the awareness of the recent microbiological issues and techniques that will be used during practical work and determined by the protocol. Integrate different knowledge (microbiology, pharmacological knowledge, biostatistics, histology ……..) to solve suggested

	problem. Continuous evaluation to the thesis outcome according to the schedule.
2nd	Identify different practical techniques and methods to assess microbiological parameters related to the subject under study. Operate scientific instruments according to instructions. Evaluate and manage hazards (chemical and biological) throughout the whole practical work. Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments). Perform tissue culturing of different types of microorganisms in variety of cultural media. Separate biological samples and tissues (e.g. blood, plasma, ……). Apply ethical recommendations during dealing with experimental animals. Understand any legal aspects related to the thesis work.
3rd	Collect raw data for the tested microbiological parameters. Interpret raw data to get valuable information. Perform statistical analysis and biological correlation for the results. Present and describe the results graphically. Suggest solution to the problem understudy based on this presented data.
4th	Communicate with supervisors to discuss results and with patients to collect case history and samples.

	Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians). Present the results periodically in seminars. Write scientific reports on the obtained results with conclusive significance. Discuss obtained results in comparison with pervious literatures. Suggest possible recommendations based on the outcome of the thesis and decide future plans. Summarize the thesis in an understandable Arabic language for non professionals. Write references in the required form (Thesis, Paper…….). Demonstrate the thesis in a final power point presentation. Continue self-learning throughout the experimental work and writing scientific papers.

5- Teaching and Learning Methods:

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

6- References:

- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for:

1. **For practical work:** U.V spectrophotometer, centrifuge, ELISA, Electrophoresis, Electronic Microscope, Light microscope, Laminar air flow, incubator, autoclave, lyophilizer, loops, swabs, bacterial dyes, swabs, microbial culture media, chemicals

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- **Head of Department: Prof. Dr. Hemmat Kamal Abdellatif**

	Matrix of PhD Thesis in Microbiology Program for 2012-2013			
	NARS	Program ILOs	Thesis ILOs	Thesis content
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- Express properly the theories and principles of microbiology and their related subjects including diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms	Demonstrate fundamentals and advanced bases of microbiology and its aspects related to main objectives of the thesis	Collect all available information about this subject by all possible means.

	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2-Recognize the methods, techniques, tools and ethics of scientific research.	Identify recent techniques, methods microbiological work as well as ethics of scientific research	• Increase the awareness of the recent microbiological issues and techniques that will be used during practical work and determined by the protocol. • Identify different practical techniques and methods to assess microbiological parameters related to the subject under study. Define ethics of scientific research. Apply ethical recommendations during dealing with humans/ experimental animals.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.3- Understand the ethical and legal principles for professional practices in microbiology.	Understand the legal aspects of for professional and academic practices	Apply ethical recommendations during dealing with humans/ experimental animals. Define ethics of scientific research.

	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4-Describe the principles of quality assurance of different antimicrobial agents using microorganisms.	Define GLP and quality assurance bases related to practical work of the thesis	Operate scientific instruments according to instructions and GLP basics.
	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.5- Outline the influence of microbiology branches such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the environment	Illustrate the outcomes of the research on the environment	• Increase the awareness of the recent microbiological issues and techniques that will be used during practical work and determined by the protocol. Define ethics of scientific research.
Intellectual Skills	2.2.1- Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B.1- Analyze and interpret data obtained from microbiology research and utilize them in a specific and suitable form.	Outline obstacles related to practical work by obtained data from the practical work	Interpret raw data to get valuable information Perform statistical analysis and biological correlation for the results. Present and describe the results graphically. Suggest solution to the problem understudy based on this presented data.

	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest significant solutions for problems discovered in microbiological results based on a wide academic background and the available information.	Discuss professional problems and suggest solutions relay on different microbiological and pharmaceutical knowledge and recent information	Suggest solution to the problem understudy based on this presented data. • Integrate different knowledge (microbiology, pharmacological knowledge, biostatistics, histology ……..) to solve suggested problem.
	2.2.3- Conduct research studies that add to the current knowledge.	B.3- Conduct research studies to increase and extend the current knowledge	Plan a research in the field of microbiology and biotechnology .	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. Design the protocol including the steps of work following the suitable timetable.
	2.2.4- Formulate scientific papers.	B.4- Write scientific reports and formulate scientific papers on the obtained results of research.	Integrate scientific results and write report following conducting research	Write scientific reports on the obtained results with conclusive significance.
	2.2.5- Assess hazards and risks in professional practice in his / her area of specialization.	B.5-Recognize possible hazards during work and how to deal with them effectively.	Manage risks and hazards related to professional practical area	Evaluate and manage hazards(chemical and biological) throughout the whole practical work.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.6- Design an effective laboratory protocol for the research to improve the performance in work.	Apply GLP principles in research to develop laboratory performance	Design the protocol including the steps of work following the suitable timetable.

	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.7- Take professional decisions in different issues during research.	Decide what to do with full responsibility in scientific research	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. Suggest possible recommendations based on the outcome of the thesis and decide future plans.
	2.2.8- Be creative and innovative.	B.8- Develop knowledge to be creative and innovative.	Illustrate creativity and innovation in modifying techniques and in utilization of various therapy.	• Identify different practical techniques and methods to assess microbiological parameters related to the subject under study.
	2.2.9- Manage discussions and arguments based on evidence and logic.	B.9- Manage discussions based on logical evidence.	Manage evidence based arguments in the field of Microbiology.	Present the results periodically in seminars
Professional and Practical Skills	2.3.1- Mastery of basic and modern professional skills in the area of specialization.	C.1- Understand the basic and recent laboratory techniques in microbiological research.	Apply and perform different techniques related to practical thesis work.	• Identify different practical techniques and methods to assess microbiological parameters related to the subject under study.

	2.3.2- Write and critically evaluate professional reports.	C.2- Write professional scientific reports in microbiological research and evaluate them.	Use and evaluate practical data to write report	Summarize the thesis in an understandable Arabic language for non professionals. Write references in the required form (Thesis, Paper…….).
	2.3.3- Evaluate and develop methods and tools existing in the area of specialization.	C.3- Develop various microbiological techniques and methods and assure the quality and suitability of instruments and tools.	Estimate laboratory techniques used in microbiology and genetics lab. Develop methods of assay of various parameters.	Operate scientific instruments according to instructions. Separate biological samples and tissues (e.g. blood, plasma, ……).
	2.3.4- Properly use technological means in a better professional practice.	C.4- Use efficiently the information technology to improve the professional practice.	Apply technology in methodology development during practical work.	Use internet, journals, books and others thesis to get previous and recent information about the subject understudy. Perform statistical analysis and biological correlation for the results. Present and describe the results graphically. Present the results periodically in seminars.
	2.3.5- Plan to improve professional practices and to improve the performance of other scholars.	C.5- Practice self assessment and assessment of others performance to improve the whole performance.	Modify laboratory techniques.	• Identify different practical techniques and methods to assess microbiological parameters related to the subject under study.

General and Transferable Skills	2.4.1- Effective communication in its different forms.	D.1- Interact effectively with patients and microbiology professionals.	Interact with health care professional.	Communicate with supervisors to discuss results and with patients to collect case history and samples.
	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.	Use information technology in review and thesis preparation	Present the results periodically in seminars Demonstrate the thesis in a final power point presentation.
	2.4.3- Help others to learn and evaluate their performance.	D.3- Set criteria for evaluating others performance in the field of microbiology and its different branches	Set rules for evaluation and judge others performance.	Discuss obtained results in comparison with pervious literatures.
	2.4.4- Self- assessment and continuous learning.	D.4- Practice self assessment for continuous learning.	Study independently and evaluate learning needs in Microbiology	Continue self-learning throughout the experimental work and writing scientific papers.

	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve information from various sources in the field of microbiology.	Reprocess up-to-date information in Microbiology.	Use internet, journals, books and others thesis to get previous and recent information about the subject understudy.
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.	Implement tasks as a member of a team.	Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians).
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Manage scientific meetings and get maximum use of time to achieve goals.	Utilize time effectively to achieve goals	Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments).