Zagazig University

Faculty of Pharmacy

Microbiology Department

Program and Course Specifications

Master and Ph.D.

Degrees

2019

Program and Course Specifications

of

Master Degree

Program Specification

Program Specification

A- Basic Information

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

2- **Program type: Single**

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

4- **Department:** Microbiology and Immunology

5- **Coordinator:** Prof. Dr. Fathy Mohammed El-Sayed Serry

6- **Date of program specification approval:** September 2019

7- **Teaching language:** English

8- **External Evaluator:** Prof. Tarek El-bana (Pharmaceutical Microbiology Department – Faculty of Pharmacy – Tanta University)

9- **Internal Evaluator:** Prof. Dr. Fathy Serry

10- **Academic Reference Standards:**

a. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 developed by the National Authority for Quality Assurance and Accreditation (**NAQAA**).

b. The program ILOs were compared to the ILOs of Biomedical Sciences MSc (in Medical Microbiology) provided by **Westminster University, UK**

B- Professional Information

1- Program aims:

Master's program, Zagazig University (PSPZU) is a 3-5 five years Master's degree in pharmaceutical sciences (Microbiology and Immunology). This Program provides postgraduate students with

knowledge, skills and abilities needed to practice the pharmacy profession effectively in various settings including Research Institutes, private and public medical laboratories, universities, National Quality Control Centers (foods & drugs) and Ministry of Health.

The program aims are summarized as follows:

1. Provide the community with postgraduates highly qualified and professionals with skills and ethical values

2. Help postgraduates to acquire the necessary knowledge and skills in areas related to microbiology, clinical microbiology, medical microbiology, immunology, biotechnology and molecular biology

3. Apply various recent quantitative techniques in medical microbiology, immunology, biotechnology and molecular biology in diagnosis, prevention and treatment of different infectious diseases as well as in production of new drugs.

4. Develop soft skills as communication, time management, critical thinking, problem solving, decision making, team working and using modern information technology.

5. Implement the sense of self learning for continuous improvement of professional knowledge and skills in postgraduates.

Consistency of the program aims with the mission of Faculty of Pharmacy:

The faculty of Pharmacy, Zagazig University aims to provide the local and regional community with highly qualified, multidisciplinary and professional pharmacists with ethical values and able to participate in the development of drug industry and quality assurance as well as contribute to a distinguished health service to the society.

2- The graduate attributes:

Upon successful completion of this program, the graduates should be able to:

1. Integrate knowledge from different fields of Microbiology & Immunology.
2. Develop research skills including: problem identification, selecting and performing different research methodology, analysis and interpretation of results
3. Apply efficiently different research techniques and advanced analytical methods in the fields of Microbiology& Immunology.
4. Define and find solutions to the professional problems in the field of pharmaceutical microbiology.
5. Communicate effectively with colleagues and other health care professionals.
6. Share in the regional development of the community by implementing the new techniques in biotechnology and their applications in production of new drugs.
7. Continue to study in autonomous manner and improve academically and professionally himself.

3-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for the holder of Master's degree in Pharmaceutical Sciences (**Microbiology and Immunology)**.

3-1- Knowledge and Understanding :

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

A.1- Build up comprehensive knowledge in biotechnology and its applications in production of useful drugs.

A.2- Comprehend all aspects of antimicrobial agents: including mechanisms of actions, methods of evaluation and assays, and microbial mechanisms of resistance to them.

A.3- Describe the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause.

A.4- Outline the basic knowledge of other sciences such as physiology, biostatistics, drug-induced diseases, applied pharmacology and instrumental analysis.

A.5- Outline the basic information in molecular biology and biotechnology.

A.6- Express the capability to distinguish microbial diseases and ways for their prevention and treatment using antimicrobial agents.

A.7- Illustrate the new information in the field of biotechnology and genetics and their applications.

A.8- Perceive the ethical and legal bases of scientific research and professional practices in microbiology.

A.9-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.

A.10- Demonstrate the basic knowledge of the principles and tools of scientific research.

3-2 - Intellectual Skills:

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

B.1- Analyze, interpret and explain the significance and potential scientific and applied aspects of data obtained from clinical microbiology, molecular biology and biotechnology laboratories.

B.2- Suggest possible ideas for resolving and investigating any studied problems in the field of microbiology and immunology.

B.3- Integrate knowledge from different areas of microbiology with relevant knowledge from other disciplines to solve health problems.

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

B.5- Recognize and assess the potential microbial and chemical hazards during work suggest how to deal with them effectively.

B.6- Design an effective laboratory protocol for a requested microbiological issue to solve significant health problems.

B.7- Take professional decisions concerning critical situations during research work

3-3- Professional and Practical Skills:

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

C.1- Perform safely the basic and recent molecular laboratory techniques in microbiological research effectively.

C.2- Select suitable reports and scientific papers related to the research point

C.3- Write professional scientific reports in microbiological research and evaluate them.

C.4- Use modern tools and techniques in microbiology and biotechnology fields.

C.5- Develop various microbiological techniques and methods and assure the validity, quality and suitability of instruments and tools.

3-4- General and Transferable Skills:

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

D.1- Interact effectively with patients and microbiologists as well as health care providers.

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

D.3- Practice self assessment and define his needs for professional development

D.4- Retrieve information from various sources.

D.5- Set criteria for evaluating the performance the others

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

D.7- Manage time effectively, to achieve goals.

D.8- Study independently for continuous self learning

4- Academic Standards:

Matrix I: Comparison between Master degree program ILOs and the **Academic Reference Standard {ARS, 2009} developed by NAQAAE**

ARS (2009)		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**- Build up comprehensive knowledge on biotechnology and its applications in production of useful drugs. **A.2**- Comprehend all aspects of antimicrobial agents: including mechanisms of actions, methods of evaluation and assays, and microbial mechanisms of resistance to them A.3- Describe the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause. A.4- Outline the basic knowledge of other sciences such as physiology, biostatistics, drug-induced diseases, applied pharmacology and instrumental analysis.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	**A.5**- Outline the basic information on molecular biology and biotechnology. **A.6**- Express the capability to distinguish microbial diseases and ways for their prevention and treatment using antimicrobial agents.

	2.1.3- Scientific developments in the area of specialization.	A.7- Illustrate the new information 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.8- Perceive the ethical and legal bases of scientific research and professional practices in microbiology.
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.9-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.
	2.1.6- The fundamentals and ethics of scientific research.	A.10- Demonstrate the basic knowledge of the principles and tools 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, interpret and explain the significance and potential scientific and applied aspects of data obtained from clinical.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Suggest possible ideas for resolving and investigating any studied problems in the field of microbiology and immunology.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Integrate knowledge from different areas of microbiology with relevant knowledge from other disciplines to solve health problems.
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct microbiological 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 and assess the potential microbial and chemical hazards during work suggest 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 a requested microbiological issue to solve significant health problems.
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions concerning critical situations during research work.
nal and Practical	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Perform safely the basic and recent molecular laboratory techniques in microbiological research effectively.

	2.3.2- Write and evaluate professional reports.	C.2- Select suitable reports and scientific papers related to the research point **C.3**- Write professional scientific reports in microbiological research and evaluate them.
	2.3.3- Assess methods and tools existing in the area of specialization.	C.4- Use modern tools and techniques in microbiology and biotechnology fields. **C.5**- Develop various microbiological techniques and methods and assure the validity, quality and suitability of instruments and tools.
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Interact effectively with patients and microbiologists as well as health care providers.
	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 and define his needs for professional development.
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources.
	2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Set criteria for evaluating the performance the others
	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- Manage time effectively to achieve goals.
	2.4.8- Continuous and self learning.	D.8- Study independently for continuous self learning.

MatrixII: Comparison between Master degree program ILOs and the ILOs of MSc of Biomedical Sciences (in Medical Microbiology), Westminster university, UK

MSc of Biomedical Sciences Program ILOs of		**Program ILOs**
Knowledge and Understanding	1. discuss and review critically the fundamental principles, concepts and terminology of the subject areas of diagnosis of infection, epidemiology, pathology and immunology of infectious diseases, including antimicrobial chemotherapy in medical microbiology	A.1- Build up comprehensive knowledge on biotechnology and its applications in production of useful drugs.. **A.5**- Outline the basic information on molecular biology and biotechnology. A.6- Express the capability to distinguish microbial diseases and ways for their prevention and treatment using antimicrobial agents A.7- Illustrate the new information in the field of biotechnology and genetics and their applications
	2. relate the physiology and growth kinetics of microorganisms to the disease process and laboratory diagnosis	A.3- Describe the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause.
	Not covered	A.4- Outline the basic knowledge of other sciences such as physiology, biostatistics, drug-induced diseases, applied pharmacology and instrumental analysis.
	3. Compare the complex and varied mechanisms of viral replication and spread within the body in relation to the disease process.	Not covered
	4. Review critically the use of immunological reagents, immunoassays and molecular technologies in the diagnosis and monitoring of infectious disease	A.9-Describe quality control principles of immunological products and quality assessment of pharmaceutical products
	5. Analyse the role of the microbiology laboratory in the diagnosis of disease.	A.3- Review the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause
	6. Review strategies used in the identification of pathogens in the diagnosis of infectious diseases ‘prions to parasites	A.3- Review the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause

	7. Develop skills to carry out epidemiological investigations and critically discuss and prioritise microbial disease prevention and infection control	A.6- Express the capability to distinguish microbial diseases and ways for their prevention and treatment using antimicrobial agents
	8.Review critically the mode of action of selected antimicrobial drugs, chemotherapeutic strategies, microbial resistance mechanisms and their selection and the role of the laboratory in its detection	A.2- Comprehend all aspects of antimicrobial agents: including mechanisms of actions, methods of evaluation and assays, and microbial mechanisms of resistance to them
Specific Skills	1. contribute to the practice of medical microbiology using skills of practical competence, critical analysis, evaluation and communication	C.1- Perform safely the basic and recent molecular laboratory techniques in microbiological research effectively
	2. reflect critically on the relationship between theory and practice in medical microbiology	C.2- Select suitable reports and scientific papers related to the research point
	3. Connect the various processes of pathogenicity, tissue damage and immunity	A.3- Review the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause (partially covered)
	4. Select correctly, carry out, and interpret the results from a wide range of diagnostic methods used in the medical laboratory	A.10- Demonstrate the basic knowledge of the principles and tools of scientific research C.5- Develop various microbiological techniques and methods and assure the validity, quality and suitability of instruments and tools.
	5. Critically examine current legal, safety and ethical issues such as patents and data protection as they relate to medical microbiology	A.8- Perceive the ethical and legal bases of scientific research and professional practices in microbiology.
	6. Devise, perform and evaluate experimental methods for investigation in medical microbiology	C.4- Use modern tools and techniques in microbiology and biotechnology fields. C.5- Develop various microbiological techniques and methods and assure the validity, quality and suitability of instruments and tools.

	7. Devise, organise and carry out an independent research project within a chosen area of medical microbiology	C.2- Select microbiological reports and scientific papers related to the research point
	8. Apply correctly statistical methods, use relevant software packages and evaluate their application to experimental data	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet
Key Transferable Skills	1. Work effectively with a group as a leader or member, to produce team seminars	D.6- Work effectively as a member of team.
	2. Use a full range of learning resources in making literature searches via the library, PubMed, World Wide Web, University intranet, and in using on-line teaching material, word processors, spreadsheets, and databases	D.2- Use effectively different computer skills such as internet, word processing, SPSS and data sheet.
	3. Show self evaluation skills, reflecting on own and others' functioning via coursework feedback, project reports, critical reviews of scientific articles and peer evaluation	D.3- Practice self-assessment and define his needs for professional development. D.5- Set criteria for evaluating the performance the others.
	4. Manage information effectively by competently undertaking research tasks and compiling reviews and discussion essays	D.4- Retrieve information from various sources in the field of microbiology. D.7- Manage time effectively to achieve goals.
	5. Show autonomy by acting as an independent and self-critical learner, managing requirements and undertaking research tasks with minimum guidance	D.3- Practice self assessment and define his needs in the field of microbiological research as well as study independently for continuous self learning. D.8- Study independently for continuous self-learning
	6. Communicate effectively by means of oral, written and poster presentations, using print and electronic resources, reporting information, ideas and actions clearly, autonomously and competently	D.1- Interact effectively with patients and microbiologists as well as health care providers. C.3- Write professional scientific reports in microbiological research and evaluate them
		B.1- Analyze, interpret and explain the significance and potential scientific and applied

	7. demonstrate problem solving skills by interpreting data, designing and carrying out projects and experimental work, and making professional use of others where appropriate	aspects of data obtained from clinical. **B.2**- Suggest possible ideas for resolving and investigating any studied problems in the field of microbiology and immunology **B**.3- Integrate knowledge from different areas of microbiology with relevant knowledge from other disciplines to solve health problems. **B.4**- Conduct microbiological research and write scientific reports on the obtained results of research **B.5**- Recognize and assess the potential microbial and chemical hazards during work suggest how to deal with them effectively **B.6**- Design an effective laboratory protocol for a requested microbiological issue to solve significant health problem B.7- Take professional decisions concerning critical situations during research work

5-Curriculum Structure and Contents:

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

b- Program structure:

- The Master program can be completed in 3-5 years.
- The Faculty of pharmacy implements the credit hour system.
- The general academic year consists of 2 semesters. Minimum credit hours that can be registered each semester: 8 credit hours & Maximum credit hours that can be registered each semester: 12 credit hours
- The program is structured as:

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

Compulsory: 12 h

Elective: (2x4) 8 h

Special: (3x4) 12 h

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:

Course Code	Course Title	Credit hours	Program ILOs Covered
	General Courses:		
M110	1- Molecular Biology	4	A1, A5, A7, B1, B3, D1, D2, D4, D6, D8
M112	2- Physiology	2	A4, B7, D1, D4
M111	3- Biostatistics	2	A4, B1, D1, D2
M102	4- Instrumental Analysis & chromatography II	4	A4, A8, B6, D2, D6
ME4	5- Elective A Biotechnology	4	A1, A5, A7, B1, B3, D2, D4, D6
ME5 ME7	6- Elective B Applied Pharmacology Drug induced diseases	 4 4	 A4, B3, D2, D6 A4, B3, D1, D4
	Special Courses:		
Isp1	Advanced Microbial Biotechnology	4	A1, A5, A7, B1, D2, D4, D6, D8
Isp2	Advanced Pharmaceutical Microbiology	4	A2, A6, A7, A9, B1, B3 D1, D2, D4, D6, D8
Isp3	Clinical Microbiology	4	A3, A6, B1, D2, D4, D6, D8

	Thesis	30	A1, A2, A3, A4, A5,A6, A7, A8, A9, A10, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3, C4, C5, D1, D2, D3, D4, D5, D6, D7, D8

a- TOEFL (400 units)

b- Computer course

c-Program Curriculum:

d**. ILOs in domains of teaching strategies & assessment method**

ILOs	teaching method	assessment method
Knowledge and Understanding Intellectual Skills	Lectures Case study Self learning	Written and oral Exam
Professional and practical Skill	Case study Problem solving Thesis	Practical Exam Case discussion Discussion
Intellectual Skills General and Transferable Skills	Group presentation Thesis	Oral Exam Discussion

6-Program admission requirements:

General Admission Conditions

- The Applicant should finish or being permanently or temporarily exempted from the military service and temporary exemption should be valid for at least one year from the date of beginning of

study. (Exceptions apply for demonstrators and assistant lecturers).

- The applicant admission to the M.Sc. program should be no later than ten years from the time of graduation.
- Acquisition of an approval from the Faculty Council following an approval of concerned Departmental Board as well as Graduate Studies and Research Committee recommendation within a maximum of one month for any conditions stated by the concerned Departmental Board.

Admission Conditions for M.Sc. degree

In addition to the general admission conditions stated before, applicants are admitted to M.Sc. degree upon fulfillment of the following:

The applicants should be holders of Bachelor in Pharmaceutical Sciences from any Faculty of Pharmacy with a general grade at least good (this condition was cancelled by a University Council dated 26/11/2013) affiliated to Egyptian Universities or an equivalent degree granted by any institute recognized by the Supreme Council of Universities.

The Faculty council is allowed, on consent of the concerned Departmental Board as well as Graduate Studies and Research Committee, to accept student for registration of M.Sc. degree if he has got a diploma from one of the Egyptian Universities in one of the pharmaceutical sciences fields, Faculties, or Institutes that are recognized by the Supreme Council of Universities with a general grade of Good regardless his grades in bachelor degree.

Students should fulfill all the admission requirements stated by the concerned Departmental Board (ICDL certificate, local TOEFL certificate with a grade at least 450).

Admission has to be done within the period announced by the university. Candidate thesis discussion can't be before one calendar year from research point registration.

Regulations to complete the program:

Conditions of granting the degree

The Faculty Council, in compliance with the concerned Departmental Board as well as Graduate Studies and Research Committee recommendation awards the M.Sc. degree upon fulfillment of the following requirements:

- Carrying out a deep research in the area of specialization for at least one or two calendar years and at most three years from the time of registration.
- The student has to pass all courses examinations.
- Acceptance of the research thesis by the Jury Committee according to statement 104 of universities regulating law.

Cancellation of Registration

The Faculty Board is allowed to cancel registration for M. Sc. programs in the following circumstances

- Student's failure to pass the course examinations for two times.
- Student's nonattendance or unsatisfactory progress (at least two annual reports) in research work being reported by the advisors and chief supervisor to the Departmental Board and forwarded to the Graduate Studies and Research Committee recommendation for approval of cancellation.
- Dissertation refusal by the Jury Committee.
- Incapability of the student to graduate by the deadlines indicated.

7- Admission Policy:

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

8-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%

9-Failure in Courses:

Students who fail to get 60% (1 point). In this case, students can register the course again and their grades are those obtained on repeating the course with maximum GPA **3**.

10-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Prof. Dr. Fathy Serry	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Prof. Dr. Tarek El-Banna	Program evaluation Courses evaluation	Program report Courses report
Candidates and Stakeholders	Questionnaires	Results of the questionnaires
Others methods	Matrix with ARS	The Matrix

Program coordinator **Head of Department**

Prof. Dr. Fathy Serry **Prof. Dr. Nehal El-sayed**

General Courses

offered by

Microbiology and Immunology Department

in conjunction with

Biochemistry Department

Biotechnology

Course Specification of Biotechnology

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology department in conjunction with Biochemistry department
- **Date of specification approval:** 2019

1-Basic Information:

Title: Biotechnology Code: ME4

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, the exploitation of gene cloning and recombinant DNA technology in production of useful microbial industrial strains and in monoclonal antibody technology, apply conventional genetic approaches and molecular genetics approaches in biotechnology, explain the bases of molecular genetics, and basic gene cloning strategies and tools and explore the basis of stem cell biotechnology and the regenerative medicine.

3-Intended learning outcomes (ILOS) of Biotechnology:

A- Knowledge and Understanding	
1a	Outline the principles of biotechnology techniques
2a	Explain how to manage and exploit knowledge of DNA cloning, recombinant DNA, and applied technology
3a	Summarize recent medical biotechnology applications.
a4	Identify the principles of stem cell biotechnology and regenerative medicine
B- Intellectual skills	
b1	Express the principles biotechnology in medicine, agriculture and pollution control.
b2	Associate the principles of recombinant DNA technology in gene cloning and assessment of the microbial transformation
b3	Discuss the principles of PCR technology in the assessment of microbial mutation, gene detection, gene sequencing & forensic medicine
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,…etc.
d3	Search on various topics and write reports or term papers.
d4	Work as a member in a team and communicate effectively with the other members of the team

4-Course content of Biotechnology:

Week No.	Lecture content (2 hrs/week) (Microbiology Department)	Lecture content (2 hrs/week) (Biochemistry Department)
1	Introduction to biotechnology	Pharmacokinetics and pharmacodynamics of peptides and protein drugs a- Elimination of protein therapeutics b- Distribution of protein therapeutics
2	DNA Recombination: • Naturally occurring genetic recombination • Artificially occurring genetic recombination (in laboratory)	Pharmacokinetics and pharmacodynamics of peptides and protein Drugs c- Protein binding of protein d- Chemical modification of protein therapeutics
3	Requirements for genetic engineering	Hematopoietic Growth Factor a- Chemical description b- Pharmaceutical concerns c- Clinical and practice aspects d- Toxicities
4	Gene Cloning: • General strategy for gene cloning • Obtaining the target genes	INTERLEUKINS a- Interleukins 1-17 b- Introduction and chemical Description – Pharmacology
5	Gene Cloning: • Finding suitable cloning vectors • Joining target gene(s) to vector • Insertion of hybrid (recombinant) DNA into expression host	INTERLEUKINS c- Interferon's alpha , Beta , Gamma d- Pharmaceutical concerns e- Clinical and Practice aspects

	(transformation) and selection of transformant	
6	Applications of genetic engineering **Activity**	INSULIN a- Introduction b- Pharmacology and Formulations c- Pharmaceutical concerns, chemical and physical stabilities d- Clinical and practice aspects **Activity**
7	Polymerase chain reaction (PCR) Types of PCR • Traditional PCR • rt PCR • Real time PCR	Growth hormones a- hGH structure , Isolation b- Pharmacology
8	Applications of PCR: 1- gene amplification for: • gene cloning • gene sequencing • gene control drug production 2- diagnosis of microbial infections 3- in forensic medicine	Growth hormones c- Protein manufacture , formulations d- Clinical use
9	Monoclonal antibody (MAb) technology (synthesis of Ab in laboratory): • hybridoma technology • production & selection of Ab • types of genetically engineered MAb (mouse, chemeric, humanized, human) • nomenclature of MAb according to the target and source	Dispensing Biotechnology products a- Introduction – Storage b- Handling c- Preparations

	• Global Marketing pharmaceutically useful MAb	
10	Stem cells technology: • Types of stem cells • Isolation • Culturing • Applications of stem cells in regenerative medicine	Dispensing Biotechnology products d- Administration e- Outpatient/Homecare use f- Patient assessment
11	Advances in vaccine preparation	Biotechnology for pharmaceutical products a- Hormones b- Preparation of vaccines and other biological products
12	Gene sequencing	Biotechnology for pharmaceutical products c- Old , modern Biotechnology d- Applications in Medicine-industry – Agriculture – Ecology
13	Microarray technology	PCR , LCR ,applications in forensic medicine- Mutations- RFLP…..etc
14	Presentation of students activities and open discussion	
15	Written Exam	

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion and presentations
- Critical thinking

6-Student Assessment methods:

- Written exams to assess: a1, a2, a3, a4, b1, b2, b3

- Oral exam to assess: a1, a2, a3, a4, b1, b2, b3
- Activity to assess: d1, d2, d3, d4

Assessment schedule:

Assessment (1): Activity	Week 6,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books:

A- Scientific papers

B- Essential books:

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.
3. Thieman, W.J.; Palladino, M.A. (2008). *Introduction to Biotechnology*. Pearson/Benjamin Cummings. ISBN 0-321-49145-9.

4. Higuchi, R., Dollinger, G., Walsh, P.S. & Griffith, R. (1992) Simultaneous amplification and detection of specific DNA sequences. *Biotechnology*, 10, 413–417. [The first description of real-time PCR].
5. VanGuilder, H.D., Vrana, K.E. & Freeman, W.M. (2008) Twenty-five years of quantitative PCR for gene expression analysis. *Biotechniques*, 44, 619–624.

C- Suggested books:

1. Biotechnology in health care: an introduction to biopharmaceuticals

2. Ermak G., (2013), Modern Science & Future Medicine (second edition)

D- Websites: pubmed, Science direct, Nejm, Weilyinterscience, EKB

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof. Dr/ Ashraf Ahmed Kadry**
  Prof. Dr/ Mohammed El-Sewedy
- **Head of Department: Prof. Dr/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Biotechnology (2019)

Course Contents		ILOs of Biotechnology course										
		Knowledge and Understanding				Intellectual skills			General and transferable skills			
		a1	a2	a3	a4	b1	b2	b3	d1	d2	d3	d4
1	Introduction to biotechnology	x										
2	Bioprocess	x										
3	Downstream processing	x										
4	Cell culture - Activity	x				x	x	x				
5	Hybridoma technology	x										
6	Medical biotechnology			x	x							
7	Medicine from cultured cells			x	x							
8	DNA Recombination & Application of genetic engineering		x	x	x							
9	Principle of PCR technology and gene amplification.	x	x				x	x				
10	Applications and advances in PCR			x	x		x	x				
11	Hybridoma technology& Monoclonal antibody(MAb)-technology & Production Nomenclature of MAbs				x							
12	Global Marketing Pharmaceutically useful monoclonal antibodies			x	x							
13	Applications and advances in PCR			x	x		x	x				
14	• Vaccine preparations • Stem cells technology & • Regenerative medicine. • **Activity** (presentation)			x	x	x	x	x	x	x	x	x

Matrix II of Biotechnology (2019)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching & learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Build up comprehensive knowledge on biotechnology and its applications in production of useful drugs.	a1- a2- a3- a4	Introduction to biotechnology- Bioprocess- Downstream processing- Cell culture- Hybridoma technology-Medical biotechnology- Medicine from cultured cells- DNA Recombination & Application of genetic engineering - Principle of PCR technology and gene amplification.- Applications and advances in PCR- Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of Mabs- Global Marketing Pharmaceutically useful monoclonal antibodies - Applications and advances in PCR -Vaccine preparations- Stem cells technology & Regenerative medicine.	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.5- Outline the basic information on molecular biology and biotechnology.	a1- a2- a3- a4		Textbooks, Scientific papers and self learning	x	X	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.7- Illustrate the new information in the field of biotechnology and genetics and their applications.	a1- a2- a3- a4		Textbooks, Scientific papers and self learning	x	X	x	x	

Intellectual skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze, interpret and explain the significance and potential scientific and applied aspects of data obtained from microbiology and clinical microbiology and molecular biology and biotechnology laboratories	b1-b2-b3	Medical biotechnology- Medicine from cultured cells- DNA Recombination & Application of genetic engineering - Applications and advances in PCR- Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of Mabs- Global Marketing Pharmaceutically useful monoclonal antibodies - Applications and advances in PCR -Vaccine preparations- Stem cells technology & Regenerative medicine.	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems	B.3- Correlate microbiological with relevant knowledge from other disciplines in managing and solving health problems.	b1-b2-b3		Textbooks, Scientific papers and self learning	x	x	x	x	
General and transferable skills	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 d3	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning	x	x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d2	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning	x	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.	d4	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning					

Molecular Biology

Course Specification of Molecular Biology

A- Course specifications:

- 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: Microbiology and Immunology department in conjunction with Biochemistry department
- Date of specification approval: September 2019

1-Basic information:

Title: Molecular biology Code: M110

Lectures: 4 hrs/ week Credit hrs: 4 hrs

Total: 4 hrs/week

2- Overall aims of the course:

On completion of the course, the students will be able to manifest a comprehensive knowledge on structure and function of DNA, RNA and protein, understand the mechanisms of DNA replication, transcription and protein synthesis, comprehend gene expression and regulation and understand the modern molecular biology techniques.

3-Intended learning outcomes (ILOS) of Molecular biology:

A-Knowledge and Understanding	
a1	List the types structure and function of nucleic acids and proteins
a2	Identify basic processes and control mechanisms involved in replication and repair of DNA
a3	Identify expression of genes and regulation of genetic traits and connection of these processes with genetic diseases
a4	Explain the techniques employed in molecular biology studies
B-Intellectual skills	
b1	Handle information and solve problems related to molecular biology, using oral, written, symbolic, graphical and numerical forms of presentation
b2	Make reasonable judgments by acquiring, combining, and evaluating quantitative and non quantitative information.
b3	Integrate knowledge, handle complexity, and formulate judgments with incomplete or limited information
b4	Interpret and explain data and findings of experiments in molecular biology
D-General and Transferable skills	
d1	Conduct a web-based search on a topic related to molecular biology to produce reports and presentations
d2	Learn independently and to develop professionally, including the ability to pursue further research where appropriate
d3	Communicate effectively, with colleagues and a wider audience
d4	Work effectively as a part of team
d5	Develop different computer skills

4- Course Content of Molecular Biology

Week No.	Lecture content (4 hrs/week)
1	Introduction and Brief History of Molecular Biology: Transmission genetics, The Molecular Nature of Genes and

	genome. Introduction to gene function (storing information, replication, mutation)
2	Structure of biological macromolecules: Protein structure, general properties and functions (Primary Structure, Protein Folding, Secondary Structure, Alpha Helix, Beta Sheets, Tertiary Structure, Protein Domains, Quaternary Structure)
3	Structure of biological macromolecules: Nucleic Acids properties, structure and types of Nucleic acid. Physical and chemical of nucleic acids. Nucleic acid as a genetic material.
4	Replication and repair of DNA in prokaryotic organisms (Replication origins and regulation Recombination, rearrangement, chromosome structures),
5	Nucleic acid (genetic material) organization and replication in Eukaryotic cell. Chromatin Structure (histones, nucleosomes) and its Effects on Transcription and gene activity
6	Synthesis of RNA from DNA: Transcription in prokaryotic cells (RNA polymerases, Prokaryotic transcription) and in eukaryotic cells (RNA polymerases, Mechanisms and control of transcription in eukaryotes), and RNA processing in eukaryotes.
7	Synthesis of proteins (Translation of m RNA) in prokaryotic cells, and translation and processing in eukaryotic cells **Activity**
8	Regulation of gene expression in prokaryotes: Operons (Fine Control of Bacterial Transcription, the lac operon, the ara operon, the trp operon, riboswitches, Major Shifts in Bacterial Transcription: sigma factor switches, the RNA polymerase encoded in phage T7, infection of E coli by phage λ.
9	DNA-Protein Interactions in Bacteria: the λ family of repressor, the trp repressor, general consideration on protein DNA interaction, DNA binding proteins
10	Molecular Tools for Studying Genes and Gene Activity: molecular separation, labeled tracers, using nucleic acid hybridization, mapping and quantifying nucleic acid transcripts

11	Measuring transcription rate in vivo, assaying DNA protein interaction, finding RNA sequences that interact with other molecules, knockouts.
12	Transposition: bacterial transposons, eukaryotic transposons, rearrangement of immunoglobulin genes. Retrotransposons
13	Bioenergetics and other macromoleucles (lipids, fats, complex carbohydrates and their roles in cell)
14	Regulation and integration of metabolism in prokaryotics Genomics, Proteomics, and Bioinformatics **Activity** (Students presentation and open discussion)
15	**Written Exam**

5- Teaching and learning methods:

- Lectures (overhead project, data show, board)
- Self learning: by assignments
- Open discussion and presentations
- Critical thinking

6- Student assessment methods:

- Written exam assess: a1, a2, a3, a4, b1, b2, b3, b4
- Oral exam assess: a1, a2, a3, a4, b1, b2, b3, b4
- Activity assess: d1, d2, d3, d4, d5

Assessment schedule:

Assessment (1): Activity	Week 7,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

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. Weaver, RF (ed). (2012).”Molecular Biology”, 5th Ed, McGraw Hill Companies.USA
2. 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.
3. Brown, T.A. (1991). Essential Molecular Biology - A Practical approach. Vol-I, Vol - n , Oxford Univ. Press. Oxford.

C -SUGGESTED BOOKS

1. Benjamin, L. (1990). Gene. IV Edn. Oxford Univ. Press, Oxford.
2. David, J., Ulley and Eckstein, F. (1992). Nucleic Acids and Molecular Biology. Vol-6, Springer-verlag Berlin Heidelberg.
3. Desmond, S.T., and Nicholl. (1994). An Introduction to genetic Engineering Cambridge Univ. Press. Cambridge.
4. Freifelder, D. (1990). Microbial genetics. Narosa Pub. Home. India.
5. Gardner, E.J. (1991). Principles of Genetcis. John Wiley and Sons Inc..
6. Pollard ,Thomas D.and ; William C. Earnshaw (2004) .Cell Biology . Philadelphia: Saunders.
7. Lodish, Harvey, Arnold Berk, S. Lawrence Zipursky, Paul Matsudaira, David Baltimore, James Darnell Molecular Cell Biology, 4th ed (2000), New York
8. Watson, JB., Gflnian, M., Witkowshi, J. and Zoller, M. (1992). Recombinant DNA. 2Dd Edn.

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience, EKB

Facilities required for teaching and learning:

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

- **Course Coordinators:**

  Prof. Dr. Fathy Mohammed El-Sayed Serry

Prof Dr/ Mohamed Mahmoud El-Seweidy

- **Head of Department: Prof Dr/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Molecular Biology (2019)														
Course Contents		ILOs of Molecular Biology course												
		Knowledge and Understanding				Intellectual skills				General and transferable skills				
		a1	a2	a3	a4	b1	b2	b3	b4	d1	d2	d3	d4	d5
1	• DNA ,RNA structure, function • Difference between DNA & RNA	X	X											
2	• DNA replication steps	X												
3	• Types of RNA • Genetic code		X											
4	• Protein synthesis • Alteration of nucleotide sequence		X											
5	• Genetic engineering • DNA cloning • Applications of cloning in treatment of diseases -activity			X	X	X	X			X	X	X	X	X
6	• Genomic DNA libraries, c DNA • PCR, LCR and their applications			X				X	X					
7	• RFLP • Linkage of polymorphism with gene mutation • Prenatal diagnosis, Diagnosis of sickle cell disease			X	X	X	X							
8	• Sequencing of DNA (chemical method)	x												
9	• Sequencing of DNA (enzymatic method)	x												
10	• Electrophoresis	x												
11	• Sothern, western and northern blotting	x												
12	• Sequencing of proteins		X											
13	• Synthesis of genes	x												
14	• Monoclonal antibodies activity (presentation)				X		X	x	X	X	X	X	X	X

Matrix II of Molecular Biology (2019)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas	A.1- Build up comprehensive knowledge on biotechnology and its applications in production of useful drugs.	a1- a2- a3- a4	DNA structure, function. DNA replication steps - g DNA libraries, c DNA -Sequencing of DNA (chemical method)- Sequencing of DNA (enzymatic method)- Electrophoresis- Sothern, western and northern blotting- Synthesis of genes- RNA structure, function.- Difference between DNA and RNA- Types of RNA- Genetic code- Protein synthesis-Alteration of nucleotide sequence - Sequencing of proteins- Genetic engineering- DNA cloning- PCR, LCR and their applications- RFLP- Linkage of polymorphism with gene mutation- Applications of cloning in treatment of diseases-Prenatal diagnosis, Diagnosis of sickle cell disease- Monoclonal antibodies	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.5- Outline the basic information on molecular biology and biotechnology.				x	X	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.7- Illustrate the new information in the field of biotechnology and genetics and their applications.				x	x	x	x	

Intellectual skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze, interpret and explain the significance and potential scientific and applied aspects of data obtained from microbiology and clinical microbiology and molecular biology and biotechnology laboratories	b1-b2-b3- b4	Genetic engineering- DNA cloning- PCR, LCR and their applications- RFLP- Linkage of polymorphism with gene mutation- Applications of cloning in treatment of diseases-Prenatal diagnosis, Diagnosis of sickle cell disease- Monoclonal antibodies	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems	B.3- - Correlate microbiological with relevant knowledge from other disciplines in managing and solving health problems.	b1-b2-b3- b4		Textbooks, Scientific papers and self learning	x	x	x	x	
General and transferable skills	2.4.1- Communicate effectively.	D.1- Interact effectively with patients and microbiologists as well as health care providers.	d3	Activity (reports)- open discussion	Textbooks, Scientific papers and self learning	x	x			x
	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 d5	Activity (reports)- open discussion		x	x			X
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d1	Activity (reports)- open discussion		x	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.	d4	Activity (reports)- open discussion		x	x			x

	2.4.8- Continuous and self learning	D.8- Study independently and plan research studies	d2	Activity (reports)- open discussion		x	x		x	X

General Courses offered by other departments

Instrumental Analysis and Chromatography II

Course specification of Instrumental Analysis and Chromatography 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 & Immunology
- Department offering the course: Analytical Chemistry.
- Date of specification approval: 2019

1- Basic information:

Title: Instrumental Analysis & chromatography 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 should be able to outline the basic and applications of different instrumental techniques, 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	Select the most appropriate instrumental technique used for 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	
d1	Acquire Computer skills such as preparation of scientific presentations and collecting information through different data-bases.
d2	Work successfully as a productive member of the team
d3	Improve scientific brain storming capabilities and cooperate with other team members

4. Course Contents:

Week No.	Content
1	**Instrumental Analysis:** *Introduction *Principles
2	**[Ultraviolet (UV)and Visible spectrophotometry** *Theory *Instrumentations
3	**[Infrared (IR) spectroscopy].** *Theory *Instrumentations
4	**Applications of UV and IR**
5	**Nuclear magnetic resonance (NMR).** *Theory **Instrumentations
6	**Mass-spectrometry (MS)** *Theory *Pharmaceutical and biological applications.
7	**Applications of NMR and MS**
8	**Electrochemistry** **Conductometry, Potentiometry.** *Theory *Pharmaceutical and biological applications.
9	**Chromatography:**

	*Introduction *Classification
10	**Quantitative and Qualitative Chromatographic techniques** *Basis *Pharmaceutical and biological applications
11	**HPLC** *Basis *Types Isocratic flow and gradient elution Particle size, Pore size, Pump pressure, detectors and applications
12	**Gas Chromatography** *Basis *Pharmaceutical and biological applications *Detectors
13	Student activities
14	**Revision and Open discussion**
15	**Written exam**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Student scientific presentation.
- Homework assignments
- Internet based search
- Problem solving

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 13
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Time	Marks
Written exam	Week 15	75
Oral Exam	Week 15	15
Activity	Week 13	10

7- References and books:

A-Scientific papers

B- Essential books:

- Modern Analytical Chemistry, David Harvey, McGraw-Hill Companies, first edition, 2002.
- Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Crouch Thomson Brooks/Cole, 2007
- Handbook of instrumental techniques of analytical chemistry, Frank A. Settle, Prentice Hall PTR, 1997.

C- Suggested books:

- British Pharmacopoeia, HM Stationery Office, London, UK, PA, 2007,
- Martindale: The Complete Drug Reference, Pharmaceutical Press; 35 edition (2007) .

Websites and journals:

- www.rsc.org
- www.sciencedirect.com
- www.pubmed.com
- www.medline.com
- www.ekb.eg/

- Guidance for Industry: Q2B of Analytical Procedures; Methodololgy: International Conference of Harmonization (ICH). Nov. 1996 (http:/ www.fda.gov/eder/guidance /1320fnl.pdf).
- Journal of Chromatography A and B, Separation sciences, Analytical and Bioanalytical Chemistry, Bioanalysis, Analytical letters.

8-Facilities required for teaching and learning:

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

For search and self learning: Faculty and University libraries

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- **Course Coordinators:**
  Prof Dr / Hisham Ezzat
  Prof Dr/ Magda Elhenawee
- **Head of Department:**
  Prof Dr/ Magda Elhenawee

Date: **تم اعتماد توصيف المقرر في مجلس القسم بتاريخ 9 / 2019**

Matrix I of Instrumental Analysis and Chromatography II								
	Course Contents	ILOs of Instrumental Analysis and Chromatography II course						
		Knowledge and understanding		Intellectual skills		General and Transferable skills		
		a1	a2	b1	b2	d_1	d_2	d_3
1	**Instrumental Analysis:** *Introduction *Principles	x						
2	**[Ultraviolet (UV)and Visible spectrophotometry** *Theory *Instrumentations	x	x	x				
3	**[Infrared (IR) spectroscopy].** *Theory *Instrumentations	x	x	x				
4	**Applications of UV and IR**	x	x	x				
5	**Nuclear magnetic resonance (NMR).** *Theory **Instrumentations	x	x	x				
6	**Mass-spectrometry (MS)** *Theory *Pharmaceutical and biological applications.	x	x	x				
7	**Applications of NMR and MS**	x	x	x				
8	**Electrochemistry Conductometry, Potentiometry.** *Theory *Pharmaceutical and biological applications.	x	x	x				
9	**Chromatography:** *Introduction *Classification	x						
10	**Quantitative and Qualitative Chromatographic techniques** *Basis	x	x	x				

	*Pharmaceutical and biological applications							
11	**HPLC** *Basis *Types Isocratic flow and gradient elution Particle size, Pore size, Pump pressure, detectors and applications	x						
12	**Gas Chromatography** *Basis *Pharmaceutical and biological applications * Detectors	x						
13	Student activities			x	x	x	x	x
14	**Revision and Open discussion**	x	x	x	x	x	x	x

Matrix II of Instrumental Analysis and Chromatography II (2019)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral Exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.4- Understand the basic knowledge of other sciences such as physiology, biostatistics, drug-induced diseases, applied pharmacology and instrumental analysis.	a1	Instrumental Analysis--UV-visible spectrophotometry, Fluorometry--IR---NMR--Conductometry, Potentiometry--MS-- ---chromatography---HPLC, GC, applications	Textbooks, Scientific papers and self learning	x	x	X	x	
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.8- Perceive the ethical and legal bases of scientific research and professional practices in microbiology.	a2	Instrumental Analysis--UV-visible spectrophotometry, Fluorometry--IR---NMR--Conductometry, Potentiometry--MS-- ---chromatography---HPLC, GC, applications	Textbooks, Scientific papers and self learning	x	x	X	x	

	2.2.6- Plan to improve performance in the field of specialization.	B.6- Design an effective laboratory protocol for a requested microbiological issue to solve significant health problems.	b1, b2	Instrumental Analysis--UV visible spectrophotometry, Fluorometry--IR---NMR--Conductometry, Potentiometry--MS-- ---chromatography---HPLC, GC, applications	Textbooks, Scientific papers and self learning	x	x	x	x	
General and transferable skills	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			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.	d2, d3	Activity			x			X

Physiology

Course specification of Physiology

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 & Immunology
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2019

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 human physiological functions of the different body organs.

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	Use literature and scientific evidences to take decisions concerning physiological problems
General and Transferable skills	
d1	Communicate effectively in oral and written forms.
d2	Retrieve information from different resources

4. Course Content of Physiology:

Week No.	Lecture contents (2hrs/week)
1	Nerve & Muscle
2	Autonomic Nervous System 1 (Sympathetic nervous system)
3	Autonomic Nervous System 2 (Parasympathetic nervous system)
4	Cardiovascular System 1 (Structure, functions and properties of the heart)
5	Cardiovascular System 2 (Heart rate, cardiac output and blood pressure)
6	Central Nervous System 1 (Structure of brain and spinal cord)
7	Central Nervous System 2 (Reflexes and pain)
8	Kidney (Structure, function and urine formation)
9	Respiratory System (Structure and functions of the lung, mechanism of breathing) **Activity** (Review article- Presentation)
10	GIT (Functions of gastric secretions and Neurohormonal regulation)
11	Endocrine System 1 (Hypothalamus, thyroid, parathyroid glands)
12	Endocrine System 2 (Adrenal gland and endocrine pancreas)
13	Blood physiology (Functions of blood cells and clotting mechanisms)
14	Membrane physiology (Structure and functions)
15	Written exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Case study

6- Student Assessment methods:

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

Assessment schedule:

Assessment (1): Activity	Week 9
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

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. 4thed
- Guyton physiology (2006) Arthur C. Guyton, John E. Hall, 11thedition 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 coordinator Prof. / Hany El-Bassossy**
- **Head of Department: Prof Dr/ Mona Foad**

Date: **تم اعتماد توصيف المقرر في مجلس القسم بتاريخ 9 / 2019**

Matrix I of Physiology						
Week number	Course Contents	Knowledge and understanding		Intellectual skills	General & Transferable skills	
		a1	a2	b1	d1	d2
1	Nerve & Muscle	X	X	X		
2	Autonomic Nervous System 1	X	X	X		
3	Autonomic Nervous System 2	X	X	X		
4	Cardiovascular System 1	X	X	X		
5	Cardiovascular System 2	X	X	X		
6	Central Nervous System 1	X	X	X		
7	Central Nervous System 2	X	X	X		
8	Kidney	X	X	X		
9	Respiratory System- Activity	X	X	X	x	X
10	GIT	X	X	X		
11	Endocrine System 1	X	X	X		
12	Endocrine System 2	X	X	X		
13	Blood physiology	X	X	X		
14	Membrane physiology	X	X	X		

Matrix II of Physiology

ARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self-learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A4	a1, a2	All the topics	Scientific papers, text books and Internet	X	X	X	X	
Intellectual Skills	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B7	b2	All the topics	Scientific papers, text books and Internet	X	X	X	X	
General & Transferable [illegible]	2.4.1- Communicate effectively.	D1	d1	Activity	Scientific papers, text books and Internet	X	X		X	X

	2.4.4- Use variable sources to get information and knowledge.	D4	d2	Activity	Scientific papers, text books and Internet	X	X			X

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 & Immunology
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2019

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 using statistical computer programs.

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

Knowledge and Understanding	
a1	Identify the fundamentals and principles of Biostatistics.
a2	List the different methods of statistical analysis.
Intellectual skills	
b1	Analyze statistically and interpret data obtained from pharmacological experiments in different forms.
b2	Assess the types of decision errors that can occur during using statistical tests.
General and Transferable skills	
d1	Communicate effectively with others
d2	Develop IT skills

4. Course Content of Biostatistics:

Week No.	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	Written exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Computer statistical program training
- Open discussion

6- Student Assessment methods:

- Written exam to assess: a1, a2, a3, b1 andb2.
- Oral exam to assess: a1, a2, a3, b1, b2 and d1.
- Activity to assess: d1, d2

Assessment schedule:

Assessment (1): Activity	Week 9
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

1- References and books:

A-Scientific papers

B- Essential books:

- Danial W (1995). Biostatistics: A foundation for analysis in health science. (6thed.) 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: Prof. Hany Elbassosy**
- **Head of Department: Prof Dr/ Mona Foad**

Date: **تم اعتماد توصيف المقرر في مجلس القسم بتاريخ 9 / 2019**

Matrix I of Biostatistics course

Week number	Course Contents	Knowledge & understanding		Intellectual skills		General & Transfer able skills	
		a1	**a2**	**b1**	**b2**	**d1**	**d2**
1	General principle of biostatistics 1	x	x				
2	General principle of biostatistics 2		x				
3	Presentation of data	x		X			
4	Descriptive statistics	x		X			x
5	Measures of central tendency	x					x
6	Measures of variability	x					x
7	Normal frequency distribution curve	x		X			x
8	Probability	x		X			x
9	Comparing of two means- Activity	x	x	X		X	x
10	Comparing of more than two means	x	x	X			x
11	Chi square test	x	x	X			x
12	Regression and correlation analysis	x	x	X			x
13	Complex analysis		x	X			x
14	Criteria of good experimental design				x		

Matrix II of Biostatistics

ARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.4- Outline the basic knowledge of other sciences such as physiology, biostatistics, drug-induced diseases, applied pharmacology and instrumental analysis.	a1, a2	General principle of biostatistics 1- Presentation of data - Descriptive statistics - Measures of central tendency - Measures of variability - Normal frequency distribution curve - Probability - Comparing of two means - Comparing of more than two means - Chi square test - Regression and correlation analysis	Scientific papers, text books and Internet	X	X	x	x	

Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze, interpret and explain the significance and potential scientific and applied aspects of data obtained from clinical.	b1, b2	Presentation of data - Descriptive statistics - Normal frequency distribution curve - Probability - Comparing of two means - Comparing of more than two means - Chi square test - Regression and correlation analysis - Complex analysis Criteria of good experimental design	Scientific papers, text books and Internet	X	x	x	x	
General & Transferable skills	2.4.1- Communicate effectively.	D.1- Interact effectively with patients and microbiologists as well as health care providers.	d1	Activities- Revision	Scientific papers, text books and Internet	X	x		x	x
	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.	D2	Activities- Revision	Scientific papers, text books and Internet		X			

Drug-Induced Diseases

Course specification of Drug-Induced Diseases

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: 2019

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, symptoms and diagnosis of drug-induced diseases and possible preventative methods.

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

Knowledge and Understanding	
a1	Explain the basics of drug kinetics, dynamics and adverse effects
a2	Identify common diseases induced by drugs and the associated risk factors.
Intellectual skills	
b1	Suggest possible ways to protect against or minimize some common drug-induced diseases.
b2	Specify the hazards of therapeutic regimens and how to properly select suitable regimens in different pathological conditions.
General and Transferable skills	
d1	Communicate effectively with others
d2	Retrieve information from different resources

4. Course Content of Drug Induced Disease:

Week No.	Course content
1	Introduction to drug induced-diseases
2	Drug-induced hepatotoxicity (Toxic response of the liver and mechanism of toxicity)
3	Drug-induced hepatotoxicity (Diagnosis and management)
4	Drug-induced nephrotoxicity (Toxic response of the kidney and mechanism of toxicity)
5	Drug-induced nephrotoxicity (Diagnosis and management)
6	Drug-induced CVS diseases (Toxic response of the heart and vascular system)
7	Drug-induced CVS diseases (Mechanism of toxicity)
8	Drug-induced CVS diseases (Diagnosis and treatment)
9	Activity
10	Drug-induced CNS diseases (Structure and functions of brain blood barrier, toxic response of brain and spinal cord)

11	Drug-induced CNS diseases (Mechanism of toxicity)
12	Drug-induced CNS diseases (Diagnosis and treatment)
13	Presentations
14	Open discussion
15	Written exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

- Written exam to assess: a1, a2, b1 andb2.
- Oral exam to assess: a1, a2, b1, b2, d1and d2.
- Activity to assess: d1 and d2.

Assessment schedule:

Assessment (1): Activity	Week 9
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

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.
- Drug-Induced Diseases: Prevention, Detection, and Management, 2nd Edition, Tisdale J. and Miller D. American Society of Health-System Pharmacists 2010.

Facilities required for teaching and learning:

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

- **Course coordinator: Prof. Dr. Ahmed Fahmy**
- **Head of Department: Prof Dr/ Mona Foad**

Date: **تم اعتماد توصيف المقرر في مجلس القسم بتاريخ 9 / 2019**

Matrix I of Drug Induced Disease

Week No.	Course Contents	Knowledge and understanding		Intellectual skills		General & Transferable skills	
		a1	**a2**	**b1**	**b2**	**d1**	**d2**
1	Introduction to drug induced-diseases	X					
2	Drug-induced hepatotoxicity (Toxic response of the liver and mechanism of toxicity)	X					
3	Drug-induced hepatotoxicity (Diagnosis and management)	X			X		
4	Drug-induced nephrotoxicity (Toxic response of the kidney and mechanism of toxicity)	X			X		
5	Drug-induced nephrotoxicity (Diagnosis and management)	X					
6	Drug-induced CVS diseases (Toxic response of the heart and vascular system)		X	X			
7	Drug-induced CVS diseases (Mechanism of toxicity)		X	X			
8	Drug-induced CVS diseases (Diagnosis and treatment)		X	X			
9	Activity		X	X			X
10	Drug-induced CNS diseases (Structure and functions of brain blood barrier, toxic response of brain and spinal cord)		X	X			
11	Drug-induced CNS diseases (Mechanism of toxicity)		X	X			
12	Drug-induced CNS diseases (Diagnosis and treatment)		X	X			
13	Presentations	X	X	X	X		
14	Open discussion	X	X	X	X		X

Matrix II of Drug Induced Disease

ARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.4- Outline the basic knowledge of other sciences such as physiology, biostatistics, drug-induced diseases, applied pharmacology and instrumental analysis.	a1 a2	Introduction to drug-induced disease Drug-induced hepatotoxicity 1 Drug-induced nephrotoxicity 1 Drug-induced 1 CVS toxicity Drug-induced 1 CNS toxicity	Scientific papers, text books and Internet	X	X	X	X	
Intellectual Skills	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Integrate knowledge from different areas of microbiology with relevant knowledge from other disciplines to solve health problems.	b1, b2	Drug-induced hepatotoxicity 2 Drug-induced nephrotoxicity 2 Drug-induced 3 CVS toxicity Drug-induced 3 CNS toxicity	Scientific papers, text books and Internet	X	X	X	X	

General & Transferable skills	2.4.1- Communicate effectively	D.1- Interact effectively with patients and microbiologists as well as health care providers.	d1	Activity	Scientific papers, text books and Internet		x		x	x
	2.4.4- Use variable sources to get information and knowledge	D.4- Retrieve information from various sources.	d2	Activity	Scientific papers, text books and Internet		X		X	X

Special courses

Advanced Microbial Biotechnology

Course Specification of Advanced Microbial Biotechnology

A- Course specifications:

- **Program on which the course is given:** MSc 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:** 2019

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 advanced microbial biotechnology, understand the gene cloning and the functional testing for cloned genes, the tissue culture and infection biology and their applications and advances, the bioinformatics and its different techniques and the recent applications of advanced microbial biotechnology.

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

A-Knowledge and Understanding	
a1	Identify the principles of advanced microbial biotechnology
a2	Recognize the effect of applications of advanced microbial biotechnology on the environment
a3	Illustrate up-to-date information about recent techniques of advanced microbial biotechnology
B-Intellectual skills	
b1	Evaluate and interpret data obtained from advanced microbial 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 advanced microbial biotechnology.
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 NO.	Lecture content (4 hrs/week)
1	Introduction to gene cloning: • Designing and using computer programs • Isolation of DNA from different sources • Designing primers for PCR with restriction cutting sites
2	• Ligation • Transformation: (electroporation, $CaCl_2$ technique)

3	Functional testing of cloned genes: • Western blot • Immune staining • Imaging: LSM, EM
4	Specific Functional testing (experiment design and date interpretation in vitro and in vivo)
5	Introduction to tissue culture and infection biology: • Cell lines • Media used • Passaging and preservation
6	Applications of tissue culture: • Invasion assay • Viral techniques **Activity**
7, 8	Advances in tissue culture (infection biology): • New approaches and novel methods in Stem cells cultivation and proliferation • Primary cells, epithelial cells and immune cells handling, passaging, infection, design of experiments and life imaging of genes expression in these cells For example: Dendritic cells (DCs), HeLa cells, Raw Macrophage, CoCo cells, Polarized cells, T-cells.
9	Bioinformatics: • Introduction • Computer programs
10	Bioinformatics: • Sequencing techniques and alignment program • Protein sequencing

11	Bioinformatics: • Microarray techniques
12	Applications of microbial biotechnology: • Fourth generations of vaccines DNA carrier vaccine Protein vaccine RNA vaccine
13	Applications of microbial biotechnology: • Drug targeting using microbial carriers
14	Students presentations and open discussion
15	Written exam

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion
- Critical thinking

6-Student Assessment methods:

- Written exams 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 6,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

7-References:

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. 2nd 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**, EKB**

Facilities required for teaching and learning:

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

- **Course Coordinators: Dr/ Amira El-Ganiny**
- **Head of Department: Prof Dr/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Advanced microbial biotechnology (2019)

	Course Contents	Knowledge and Understanding			Intellectual skills	General and transferable skills			
		a1	a2	a3	b1	d1	d2	d3	d4
1	Introduction to gene cloning: • Designing and using computer programmes • Isolation of DNA from different sources • Designing primers for PCR with restriction cutting sites	x			x				
2	• Ligation • Transformation: (electroporation, $CaCl_2$ technique)	x			x				
3	Functional testing of cloned genes: • Western blot • Immune staining • Imaging: LSM, EM	x			x				
4	Specific Functional testing (experiment design and date interpretation in vitro and in vivo)	x			x				
5	Introduction to tissue culture and infection biology: • Cell lines • Media used • Passaging and preservation	x	x	x	x				
6	Applications of tissue culture: • Invasion assay • Viral techniques **Activity**		x		x	x	x	x	x
7,8	Advances in tissue culture (infection biology): • New approaches and novel methods in Stem cells cultivation and proliferation • Primary cells, epithelial cells and immune cells handling, passaging, infection, design of experiments and life imaging of genes expression in these cells E.g.: Dendritic cells (DCs), HeLa cells, Raw Macrophage, CoCo cells, Polarized cells, T-cells.	x	x	x	x				

9	Bioinformatics: ● Introduction ● Computer programs	**x**		**x**	**x**				
10	Bioinformatics: ● Sequencing techniques and alignment program ● Protein sequencing	**x**		**x**	**x**				
11	Bioinformatics: ● Microarray techniques	**x**		**x**	**x**				
12	Applications of microbial biotechnology: ● Fourth generations of vaccines DNA carrier vaccine Protein vaccine RNA vaccine	**x**	**x**	**x**	**x**				
13	Applications of microbial biotechnology: ● Drug targeting using microbial carriers	**x**	**x**	**x**	**x**				
14,	Students presentations and open discussion	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**

Matrix II of Advanced microbial biotechnology (2019)

ARS (2009)		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- Build up comprehensive knowledge on biotechnology and its applications in production of useful drugs.	a1	Introduction to gene cloning: (Designing & using computer programs, Isolation of DNA from different sources, Designing primers for PCR with restriction cutting sites	Textbooks, Scientific papers and self learning	X	X	x	x	
				Ligation and Transformation: (electroporation, $CaCl_2$ technique)		X	X	x	x	
				Functional testing of cloned genes (Western blot, Immune staining, Imaging: LSM, EM)		X	X	x	x	
				Specific Functional testing (experiment design and date interpretation *in vitro* and in *vivo*)		X	X	x	x	
				Introduction to tissue culture and infection biology (Cell lines, Media used, Passaging and preservation		X	X	x	x	
				Applications of tissue culture: (Invasion assay, Viral techniques) **Activity**		X	X	x	x	x

				Advances in tissue culture (infection biology): New approaches and novel methods in Stem cells cultivation and proliferation Primary cells, epithelial cells and immune cells handling, passaging, infection, design of experiments and life imaging of genes expression in these cells (Dendritic cells (DCs), HeLa cells, Raw Macrophage, CoCo cells, Polarized cells, T-cells).		X	X	x	x	
				Bioinformatics (Introduction & Computer programs)		X	X	x	x	
				(Sequencing techniques, alignment program, protein sequencing, Microarray techniques)		X	X	x	x	
				Applications of microbial biotechnology: 4th generation of vaccines (DNA carrier vaccine, Protein vaccine & RNA vaccine)		X	X	x	x	
				(Drug targeting using microbial carriers)		X	X	x	x	
				Students presentations and open discussion		X	X	x	x	x
	2.1.2- Mutual influence between	A.5- Outline the basic information on	a2	Introduction to tissue culture and infection biology (Cell lines, Media used, Passaging and preservation)	Textbooks, Scientific papers and	X	X	x		

	professional practice and its impact on the environment.	molecular biology and biotechnology.		Applications of tissue culture: (Invasion assay & Viral techniques) **Activity**	self learning	X	X	x	x	
				Advances in tissue culture: (New approaches and novel methods in Stem cells cultivation and proliferation, Primary cells, epithelial cells and immune cells handling, passaging, infection, design of experiments and life imaging of genes expression in these cells: e.g. Dendritic cells (DCs), HeLa cells, Raw Macrophage, CoCo cells, Polarized cells, T-cells).		X	X	x	x	
				Applications of microbial biotechnology: Fourth generationsof vaccines (DNA carrier vaccine, Protein & RNA vaccines		X	X	x	x	
				(Drug targeting using microbial carriers)		X	X	x	x	
				Students presentations and open discussion		X	X	x	x	

	2.1.3- Scientific developments in the area of specialization.	A.7- Illustrate the new information in the field of biotechnology and genetics and their applications.	a3	Advances in tissue culture (infection biology): New approaches and novel methods in Stem cells cultivation and proliferation Primary cells, epithelial cells and immune cells handling, passaging, infection, design of experiments and life imaging of genes expression in these cells: e.g. Dendritic cells (DCs), HeLa cells, Raw Macrophage, CoCo cells, Polarized cells, T-cells.	Textbooks, Scientific papers and self learning	X	X	x	x	
				Bioinformatics : Introduction Computer programs, Sequencing techniques and alignment program, Protein sequencing, Microarray techniques		X	X	x	x	
				Applications of microbial biotechnology:4th generations of vaccines (DNA carrier vaccine, Protein vaccine &RNA vaccine)		X	X	x	x	
				Drug targeting using microbial carriers		X	X	x	x	
				Students presentations and open discussion		X	X	x	x	x
				Introduction to tissue culture and infection biology: (Cell lines, Media used, Passaging and preservation)		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, interpret and explain the significance and potential scientific and applied aspects of data obtained from microbiology and clinical microbiology and molecular biology and biotechnology laboratories.	b1	Introduction to gene cloning: (Designing & using computer programs, Isolation of DNA from different sources, Designing primers for PCR with restriction cutting sites		X	X	x	x	x
				Ligation and Transformation: (electroporation, $CaCl_2$ technique)		X	X	x	x	x
				Functional testing of cloned genes (Western blot, Immune staining, Imaging: LSM, EM		X	X	x	x	x
				Specific Functional testing (experiment design and date interpretation *in vitro* and in *vivo*)		X	X	x	x	x
				Introduction to tissue culture and infection biology: (Cell lines, Media used, Passaging and preservation)		X	X	x	x	x
				Applications of tissue culture: (Invasion assay and Viral techniques) **Activity**		X	X	x	x	x
				Advances in tissue culture (infection biology): New approaches and novel methods in Stem cells cultivation and proliferation Primary cells, epithelial cells and immune cells handling, passaging, infection, design of experiments and life imaging of genes		x	x	x	x	x

				expression in these cells: e.g. Dendritic cells (DCs), HeLa cells, Raw Macrophage, CoCo cells, Polarized cells, T-cells.						
				Bioinformatics: Introduction and Computer programs		X	X	x	x	x
				Sequencing techniques and alignment program, Protein sequencing		X	X	x	x	x
				Microarray techniques		X	X	x	x	x
				Applications of microbial biotechnology:4th generations of vaccine (DNA carrier vaccine, Protein vaccine, RNA vaccine		X	X	x	x	x
				Drug targeting using microbial carriers		X	X	x	x	x
				Students presentations and open discussion		X	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 study.	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:** MSc. 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:** 2019

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 retrieve information concerning various types of antimicrobial chemotherapeutic agents, including detailed spectra, their biochemical and molecular mechanisms of action, molecular bases and mechanisms of microbial resistance and mechanisms of transmission and dissemination of genetic determinants of resistance and the strategies to control resistance problems, recall all aspects of chemical non-antibiotic antimicrobial agents used as antiseptics, disinfectants, preservatives, their desirable features (potentials) and limitations to respective specific uses, and the principles and methods of their evaluation, recognize the theoretical bases of all aspects of sterilization and sterile products manufacture, sterility assurance, validation of

sterilization processes, aseptic processes, evaluate the microbial quality of pharmaceutical products, assess microbial stability and spoilage, define the desired microbial attributes and acceptance criteria, assess hazards of potential microbial contaminants and evaluate efficacy of antimicrobial preparations and explain the principles and theoretical aspects of microbiological assays and quality assurance and all compendia's quality control tests in pharmaceutical practice.

3-Intended learning outcomes (ILOS):

A-Knowledge and Understanding	
a1	Recognize the principles and practices of control of microorganisms at different settings and environment
a2	Recall the theoretical and practical aspects of sterilization, sterilizers, aseptic areas and aseptic processing and their validation
a3	Explain the principals of antimicrobial chemotherapy; review the different groups of antimicrobial chemotherapeutic agents, biochemical and molecular mechanisms of action and the mechanisms of microbial resistance to them.
a4	Describe the types of chemical non-antibiotic antimicrobial agents, their potential uses and the theoretical bases of the laboratory tests for evaluation of their efficacy.
a5	Explain the principles and techniques of microbiological assays and tests; microbial quality assessment of drugs, cosmetics and food products.
a6	Recognize the ecology of microorganisms as it affect manufacture of medicine and describe the basic features of aseptic and clean areas (clean-rooms) and restricted access barrier systems (RABS) and their validation

a7	Describe the microbial attributes of non sterile products, and recognize the quality assurance aspects in their manufacturing, and acceptance criteria of the final product and to be familiar with the principles of Hazard Analysis of Critical Control Points (HACCP).
B-Intellectual skills	
b1	Design tests and suggest experimentation procedures, involving microbial investigations to assess and solve microbiological problems in pharmaceutical practices
b2	Analyze, evaluate the data of microbiological experiments and investigations and utilize relevant data to solve problems, and suggest solutions at challenging situations
b3	Select or suggest the most appropriate method of sterilization and suggest microbial decontamination methods at different hypothetical situations
b4	Select and suggest appropriate chemotherapeutic agents , give advice with relative merits of antibiotics to treat microbial infections and propose methods for control of the resistant pathogens
b5	Interpret data concerning the evaluation of the microbiological quality of pharmaceutical products and assess risks of microbial contaminants
b6	Suggest or Design different pharmaceutical or cosmetic formulations with good microbial quality and stability.
D-General and Transferable skills	
d1	Prepare a presentation on a relevant topic and communicate effectively with colleagues

d2	Use efficiently variable sources of information and knowledge in the professional practices, including information technologies and Implement writing and presentation skills by performing an online search, writing a report and presenting the data in a seminar
d3	Work as a member or lead a team of workers
d4	Pursue continuous and independent self learning, including research where appropriate, to develop professionally

4-Course contents of Advanced pharmaceutical Microbiology:

Week	Lecture content (4 hr/week)
1	Principles and practices of sterilization: sterilization processes and aseptic manipulation
2	sterilization assurance and validation of sterilization processes and sterile products
3	clean and aseptic areas, GMP and environmental monitoring
4	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.
5	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

6	Microbiological aspects of pharmaceutical processing: Ecology of microorganisms as it effects the pharmaceutical industry; Factory and hospital hygiene and good manufacturing practice
7	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
8	**Activity**
9	Microbiological quality assessment and control
10	Role and applications of molecular biotechnology in pharmaceutical disciplines
11	Additional applications of microorganisms in the pharmaceutical sciences and pharmacopoeial (compendial) tests and assays
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	Students presentations and open discussion
15	Written exam

5-Teaching and Learning Methods:

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

- Open discussion
- Critical thinking

6-Student Assessment methods:

- Written exam to assess: a1, a2, a3, a4, a5, a6, a7, b1, b2, b3, b4, b5, b6
- Oral exam to assess: a1, a2, a3, a4, a5, a6, a7, b1, b2, b3, b4, b5, b6
- Activity to assess: d1, d2, d3, d4

Assessment schedule:

Assessment (1): Activity	Week 7,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books

A – Scientific papers

B- ESSENTIAL BOOKS

1. Hugo and Russell's (2011). Pharmaceutical Microbiology 8th edn. Edited by Stephen P Denyer, Norman A Hodges, and Sean P Gorman, Blackwell Science Inc.; Massachusetts, USA.
2. Block SS (2001)., "Sterilization, Disinfection and Preservation" 5th edn, Ed Lippincott Williams & Wilkins, London

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5. Finch, R. G., Greenwood, D., Norrby, R. & Whitley, R. (2002) Antibiotic and Chemotherapy, 8th edn. Churchill Livingstone, Edinburgh.

6. Greenwood, D. (2000) Antimicrobial Chemotherapy, 4th edn. Oxford University Press, Oxford.

7. Amyes, S. G. B, Thompson, C., Miles, R. & Tillotson, G. (1996) Antimicrobial Chemotherapy, Theory, Practice and Problems. Martin Dunitz, London.

8. Franklin, T. J. & Greenwood, D. (2000) Antimicrobial Chemotherapy, 4th edn. Oxford University Press, Oxford.

9. Russell, A. D. & Chopra, I. (1990) Understanding Antibacterial Action and Resistance. Ellis Horwood, New York.

10. Denyer, S. P. & Baird, R. M. (1990) Guide to Microbiological Control in Pharmaceuticals. Ellis Horwood, Chichester.

11. Russell, A. D., Hugo, W. B. & Ayliffe, G. A. J. (1998) Principles and Practice of Disinfection, Preservation and Sterilization, 3rd edn. Blackwell Scientific, Oxford.

C -SUGGESTED BOOKS

1. Baird, R.M. Hodges, N.A. &. Denyer, S.P (2000). Handbook of Microbiological Control: Pharmaceuticals and Medical Devices. Taylor & Francis, London.

2. Baird, R. M. & Bloomfield, S. F. L. (1996) Microbial Quality Assurance of

Cosmetics, Toiletries and Non-sterile Pharmaceuticals. Taylor & Francis, London.

3. Fraise, A. Lambert P &. Maillard J-Y (2004) Principles and Practice of Disinfection, Preservation and Sterilization, 4th edn, Blackwell Scientific, Oxford.

4. E P (European Pharmacopeia) European Pharmacopeia Commision. Strasbourg, France.

5. Russell, A. D. & Chopra, I. (1996) Understanding Antibacterial Action and Resistance, 2nd edn. Ellis Horwood, Chichester.

6. BP (British Pharmacopoeia) British Pharmacopoeia Commission. The Stationery Office, London

7. Pharmaceutical Codex London: The Pharmaceutical Press.

8. USP (United States Pharmacopoeia) US Pharmacopoeial Convention, Rockville, MD.

9. European Agency for the Evaluation of Medicinal Products (2000) Decision trees for the selection of sterilization methods. Annex to Note for Guidance on Development of Pharmaceutics. Committee for Proprietary Medicinal Products, London. CPMP/QWP/054/98 Corr.

10. Beaney, A. M. (2001) Quality Assurance of Aseptic Preparation Services, 3rd edn. Pharmaceutical Press, London.

11. Gardner, J. F. & Peel, M. M. (1998) Sterilization, Disinfection and Infection Control, 3rd edn. Churchill Livingstone,Melbourne.

12. FDA,“Guidance for Industry. Sterile Drug Products Produced by Aseptic Processing–Current Good Manufacturing Practice, draft guidance,” FDA, Rockville,MD, August (2003).

13. US Food & Drug Administration. Guidance on Sterile Drug Products Produced by Aseptic Processing,September, (2004).

14. Swarbeck J.and Boylan J., (2001) Encyclopedia of Pharmaceutical Technology, Eds. (Marcel-Dekker, New York, NY

15. G. Jacobs, "Radiation in the sterilization of pharmaceuticals," Sterile Pharmaceutical Manufacturing, Vol. 1, 1st Edition, Interphann Press, Buffalo Grove, II., 57-78 (1991).

16. European Commission, "Guide to Good Manufacturing Practice. Annex I Manufacture of Sterile Medicinal Products," (European Commission Enterprise Directorate General, Brussels, Belgium, (2003).

17. Easter M.C, (2003) Ed., Rapid Microbiological Methods in the Pharmaceutical Industry Interpharm/CRC.

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience**, EB**

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/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Advanced pharmaceutical microbiology (2019)

Course Contents		ILOs of Advanced pharmaceutical microbiology course															
		Knowledge and Understanding							Intellectual skills						General and transferable skills			
		a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	b4	b5	b6	d1	d2	d3	d4
1	Principles and practices of sterilization: sterilization processes and aseptic manipulation	x	x								x							
2	sterilization assurance and validation of sterilization processes and sterile products	x	x						x	x	x							
3	clean and aseptic areas, GMP and environmental monitoring	x	x				x				x							
4	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		x						
5	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		x						
6	Microbiological aspects of pharmaceutical processing: Ecology of microorganisms as it effects the pharmaceutical industry; Factory and	x					x	x					x	x				

	hospital hygiene and good manufacturing practice																
7	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	**x**		**x**						**x**							
8	**Activity**													**x**	**x**	**X**	**X**
9	Microbiological quality assessment and control	**x**		**x**		**x**			**x**	**x**			**x**				
10	Role and applications of molecular biotechnology in pharmaceutical disciplines						**x**	**x**					**x**	**x**			
11	Additional applications of microorganisms in the pharmaceutical sciences and pharmacopoeial tests and assays				**x**	**x**	**x**	**x**	**x**	**x**			**x**				
12	Microbiological Assays in Pharmacy. The principles and techniques of microbiological assays of drugs.			**x**	**x**	**x**			**x**	**x**			**x**				
13	Microbiological Tests in Pharmacy. The principles and techniques of microbiological analysis and tests; quality assessment of drugs, cosmetics and food.			**x**	**x**	**x**			**x**	**x**			**x**				
14	Students presentations and open discussion	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**X**	**X**

Matrix II of Advanced Pharmaceutical Microbiology (2019)

ARS (2009)		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.2- Comprehend all aspects of antimicrobial agents: including mechanisms of actions, methods of evaluation and assays, and microbial mechanisms of resistance to them.	a1, a3, a4	all the topics	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.6- Express the capability to distinguish microbial diseases and ways for their prevention and treatment using antimicrobial agents.	a2	• sterilization assurance and validation of sterilization processes and sterile products • Principles and practices of sterilization: sterilization processes and aseptic manipulation • clean and aseptic areas, GMP and environmental monitoring • Students presentations and 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.9-Describe quality control principles of immunological products and quality assessment of pharmaceutical products.	a5	• Microbiological quality assessment and control • Additional applications of microorganisms in the pharmaceutical sciences and pharmacopoeial tests & assays • 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, cosmetics and food. • Students presentations and open discussion	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.7- Illustrate the developments in the field of biotechnology, genetics and antimicrobial agents and their applications	a6, a7	• Clean and aseptic areas, GMP and environmental monitoring • Role and applications of molecular biotechnology in pharmaceutical disciplines • Microbiological aspects of pharmaceutical processing: Ecology of microorganisms as it effects the pharmaceutical industry; Factory and hospital hygiene and GMP • Additional applications of	Textbooks, Scientific papers and self learning	x	x	x	x	

				microorganisms in the pharmaceutical sciences and pharmacopoeial tests & assays • Students presentations and open discussion						
2.2	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze, interpret and explain the significance and potential scientific and applied aspects of data obtained from microbiology and clinical microbiology and molecular biology and biotechnology laboratories.	b1, b2, b5	• Sterilization assurance and validation of sterilization processes and sterile products • 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. • 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 • Microbiological quality assessment and control • Additional applications of microorganisms in the	Textbooks, Scientific papers and self learning	x	x	x	x	

				pharmaceutical sciences and pharmacopoeial tests & assays • 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, cosmetics and food. • Students presentations and open discussion						
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Correlate microbiological with relevant knowledge from other disciplines in managing and solving health problems.	b3	• Principles and practices of sterilization: sterilization processes and aseptic manipulation • sterilization assurance and validation of sterilization processes and sterile products • clean and aseptic areas, GMP and environmental monitoring • Microbial Contamination and spoilage of Pharmaceutical Products: impact of contamination and spoilage, control of microbial contamination and quality assurance of pharmaceutical products, preservation of	Textbooks, Scientific papers and self learning	x	x	x	x	

				pharmaceutical products • Students presentations and open discussion						
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Correlate microbiological with relevant knowledge from other disciplines in managing and solving health problems.	b4, b6	• 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 • 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 • Students presentations and open discussion	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.4.1-Communicate effectively.	D.1- Interact effectively with patients and microbiology professionals.	d1	Activity	Textbooks, Scientific papers and self learning		X			X

	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.	d2	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.	d1,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:** MSc. 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:** 2019

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, the clinical manifestation of disease and diagnosis of diseases based on clinical laboratory data and the epidemiology of infectious diseases and control measures and discuss the treatment of these diseases.

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	Differentiate the most suitable methods for diagnosis and treatment of different infections
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 Clinical Microbiology:

Week No.	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 and role of immunity
3	Microbial diseases of skin: Bacterial diseases: Infections by Pseudomonas and its virulence factors Propionebacterium 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 Advanced methods for treatment of these diseases
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) and role of immunity Viral diseases: Yellow fever, Dengue fever

12	Diseases of urinary and reproductive system: Bacterial diseases: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid and mechanisms of resistance 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	Students presentations and open discussion
15	Written exam

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion
- Case study

6-Student Assessment methods:

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

Assessment schedule:

Assessment (1): Activity	Week 8,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books

A –Scientific papers

B- Essential Books

1. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, (2005). Medical Microbiology, 5th ed. (Philadelphia: Elsevier/Mosby.

2. Levinson, W, (2006). Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill.

3. 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, EKB

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/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Clinical Microbiology (2019)

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 Advanced methods for treatment of these disease	x	x	x				
8	Activity		x		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	Students presentations and Open discussion	**x**	**x**	**x**	**x**	**x**	**x**	**x**

Matrix II of Clinical Microbiology (2019)

ARS (2009)		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.3- Review the biology and the pathogenesis of microbial etiologic agents, including clinical manifestation and laboratory diagnosis of the diseases they cause.	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: <u>Bacterial diseases:</u> Staphylococcal and Streptococcal infections Infections by Pseudomonas, Propioni-bacterium infections <u>Viral diseases</u> (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella) <u>Fungal diseases</u> (Cutaneous mycoses, Candidiasis)		**X**	x	x	x	
				Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis		**X**	x	x	x	
				Microbial diseases of RT: Bacterial infections, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis)		x	x	x	x	

				Fungal infections (Blastomycosis, Histoplasmosis, Aspergilloses Viral: Common cold, influenza						
				Microbial disease of digestive system Bacterial: Oral diseases; dental caries, periodontal disease Bacterial diseases of digestive tract: enteric fever, cholera, bacillary dysentery		**X**	x	x	x	
				Fungal: Mycotoxins production Viral diseases: Mumps, Gastroenteritis, Hepatitis		**X**	x	x	x	
				Microbial diseases of cardiovascular system Bacterial: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral: Yellow & Dengue fevers		**X**	x	x	x	
				Diseases of urinary and reproductive system: **Bacterial**: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid **Fungal**: Candidiasis **Viral**: Genital herpes, AIDS		**X**	x	x	x	

				Microbial diseases of nervous system **Bacterial**: Bacterial meningitis, Tetanus, Botulism, leprosy **Fungal**: cryptococcosis **Viral**: Arthropod-borne encephalitis, Rabies, poliomyelitis Students presentations and Open discussion		**X** **X**	x x	x x	x x	x
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.6- Express the capability to distinguish microbial diseases and ways for their prevention and treatment using antimicrobial agents.	a2	Microbial diseases of skin: **Bacterial**: Staphylococcal & Streptococcal infections	Textbooks, Scientific papers and self learning	**X**	x	x	x	
				Microbial diseases of skin: **Bacterial**: Infections by Pseudomonas, Propionibacterium infections		**X**	x	x	x	
				Microbial diseases of skin: **Viral**: (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)		**X**	x	x	x	
				Microbial diseases of skin: **Fungal** (Cutaneous mycoses, Candidiasis)		**X**	x	x	x	
				Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis		**X**	x	x	x	
				Microbial diseases of RT: **Bacterial**, upper and lower RTI (Tonsillitis and scarlet fever,		**x**	x	x	x	

				Diphtheria, Whooping cough, Tuberculosis) **Fungal**: Blastomycosis, Histoplasmosis, Aspergilloses **Viral**: Common cold, influenza						
				Microbial disease of digestive system **Bacterial**: 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**: Mycotoxins production **Viral**: Mumps, Gastroenteritis, Hepatitis		X	x	x	x	
				Microbial diseases of cardiovascular system **Bacterial**: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis, Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) **Viral**: Yellow, Dengue fever		**X**	x	x	x	

				Diseases of urinary & reproductive system: **Bacterial**: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid **Fungal**: Candidiasis **Viral**: Genital herpes, AIDS		**X**	x	x	x	
				Microbial diseases of nervous system **Bacterial**: Bacterial meningitis, Tetanus, Botulism, leprosy **Fungal**: cryptococcosis **Viral**: Arthropod-borne encephalitis, Rabies, poliomyelitis		**X**	x	x	x	
				Students presentations and 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, interpret and explain the significance and potential scientific and applied aspects of data obtained from microbiology and clinical microbiology and molecular biology and biotechnology laboratories.	b1	Microbial diseases of skin: Bacterial: Staphylococcal & Streptococcal infections	Textbooks, Scientific papers and self learning	**X**	x	x	x	
				Microbial diseases of skin: Bacterial: Infections by Pseudomonas, Propionibacterium infections		**X**	x	x	x	
				Microbial diseases of skin: Viral (Smallpox, Chickenpox and shingles, Herpes simplex, Measles, rubella)		**X**	x	x	x	
				Microbial diseases of skin: Fungal: (Cutaneous mycoses, Candidiasis)		**X**	x	x	x	

				Diseases of the eye: Conjunctivitis, Inclusion conjunctivitis, Trachoma, Herpetic keratitis		**X**	x	x	x	
				Microbial diseases of RT: Bacterial, upper and lower RTI (Tonsillitis and scarlet fever, Diphtheria, Whooping cough, Tuberculosis) Fungal: Blastomycosis, Histoplasmosis, Aspergilloses Viral: Common cold, influenza		**X**	x	x	x	
				Microbial disease of digestive system Bacterial: 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: Mycotoxins production Viral: Mumps, Gastroenteritis, Hepatitis		**X**	x	x	x	
				Microbial diseases of cardiovascular system Bacterial: Septicemia, Puerperal sepsis, Bacterial endocarditis, Rheumatic fever, Brucellosis,		**x**	x	x	x	

				Anthrax, Plague, Gas gangrene, Relapsing fever, Rickettsial diseases (Epidemic typhus, Endemic murine typhus) Viral: Yellow &, Dengue fever						
				Diseases of urinary and reproductive system: Bacterial: Enterobacteriaceae infections, Gonorrhoea, Syphilis, Chancroid Fungal: Candidiasis Viral: Genital herpes, AIDS		**X**	x	x	x	
				Microbial diseases of nervous system Bacterial: Bacterial meningitis, Tetanus, Botulism, leprosy Fungal: cryptococcosis Viral: Arthropod-borne encephalitis, Rabies, poliomyelitis		**X**	x	x	x	
				Students presentations and 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			X

	2.4.4- Use variable sources to get information & 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 and Immunology)
- **Major or Minor element of program:** Major
- **Department offering the program:** Microbiology Dept.
- **Department offering the thesis:** Microbiology Dept.
- **Date of specification approval:** 2019

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 and draw conclusions about the contribution to knowledge made by this study.

3- Intended learning outcome's (ILOs):

Knowledge and Understanding	
a1	Define the research area which comply with the Faculty of Pharmacy and Zagazig university research plans

a2	Explain the theories and advances of microbiological research areas related to the main objectives of the thesis
a3	Review the current developments in different microbiological and biotechnological techniques related to the thesis.
a4	Define the research problem which the thesis will handle in correlation with the community, surrounding environment and university goals
a5	Be aware of the moral and legal aspects related to the thesis work.
a6	Recall the knowledge related to GLP and quality assurance relevant to practical work of the thesis
Intellectual skills	
b1	Discuss problems related to practical work by obtained quantitative data from the practical work
b2	Outline professional problems and suggest solutions relaying 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 under study
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 steps of work following 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 (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 standards 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 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
- Problem solving
- Critical thinking
- seminars

6- References:

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

Facilities required for:

1. **For practical work:** UV spectrophotometer, Centrifuge, ELISA reader, Thermal cycler Electrophoresis, Electronic Microscope, Light microscope, Laminar air flow, Incubator, Autoclave, Ovens, Lyophilizer, loops, swabs, bacterial dyes, microbial culture media, chemicals

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- **Date: 2019 تم اعتماد توصيف الرسالة بمجلس القسم لشهر سبتمبر**
- **Head of Department: Prof. Nehal El-sayed**

Program Matrix of Master degree of Microbiology and Immunology

Program courses & thesis		Master Program intended learning outcomes																													
		Knowledge and understanding										Intellectual skills							Professional and practical skills					General and transferable skills							
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	B 1	B 2	B 3	B 4	B 5	B 6	B 7	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D8
General courses	Molecular Biology	x				x		x				x		x										x	x		x		x		
	Physiology				x													x						x			x				
	Biostatistics				x							x												x	x						
	Instrumental Analysis				x				x								x								x				x		
	Biotechnology	x				x		x				x		x											x		x		x		
	Drug induced diseases				x									x										x			x				
Special courses	Advanced Microbial Biotechnology	x				x		x				x													x		x		x		
	Clinical Microbiology			x			x					x													x		x		x		
	Advanced Pharmaceutical Microbiology		x				x	x		x		x		x										x	x		x		x		
Thesis		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

PhD Degree

Program Specification

Program Specification

A- Basic Information

1) **Program title:** PhD. in Pharm. Sci (**Microbiology and Immunology)**
2) **Program type:** Single.
3) **Faculty/ University:** Faculty of Pharmacy, Zagazig University
4) **Department:** Microbiology and immunology
5) **Coordinator:** Prof. Dr. Fathy Mohammed El-Sayed Serry
6) **Date of program specification approval:** 2019
7) **Teaching language:** English
8) **External Evaluator:** Prof. Tarek El-bana (Pharmaceutical Microbiology department – Faculty of Pharmacy – Tanta University)
9) **Internal Evaluator:** Prof. Dr. Fathy Serry

11- Academic Reference Standards:

A. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 developed by the National Authority for Quality Assurance and Accreditation (**NAQAA**).

B. The program ILOs were compared to the ILOs of Biomedical Sciences integrated PhD (Infection and Immunity) provided by **Southampton University**, UK

B- Professional Information

1- Program aims:

The PhD program, Zagazig University (PSPZU) is a 3-5 five years PhD degree in pharmaceutical sciences (Microbiology and Immunology). This Program aims at providing postgraduate students with knowledge, skills and abilities needed

to practice the pharmacy profession effectively in various settings including Research Institutes, private and public medical laboratories, universities, National Quality Control Centers (foods & drugs) and Ministry of Health.

The program aims are summarized as follows:

1. Provide the community with highly qualified and professionals with skills and ethical values

2. Develop in-depth knowledge and skills in areas related to microbiology, clinical microbiology, medical microbiology, immunology, molecular biology and biotechnology.

3. Apply various recent advanced and modern techniques in microbiology, immunology, biotechnology & molecular biology in diagnosis, prevention and treatment of microbial diseases and in production of new effective drugs and useful products.

4-Plan studies, developing and innovating methods and employing bioinformatics (genomics & proteomics) in conducting scientific research

5- Effectively use information technology for the preparation and submission of a detailed and specialized literature reviews

6-Actively participate in development of the community and increasing awareness.

2- Graduate attributes:

Upon successful completion of this program, the graduate should be able to:

1. Employ the appropriate technological methods to serve his/her professional practice.
2. Apply perfectly different research methods, techniques and tools in the field of microbiology.

3. Develop new methods, techniques and tools in professional practice.
4. Integrate knowledge in microbiology with other relevant knowledge inferring and developing their correlation.
5. Work continuously and persistently to add to knowledge in microbiology.
6. Execute a research project.
7. Be aware of the current problems and new theories in microbiology.
8. Communicate effectively and lead working team in various professional aspects.
9. Take decisions in the light of available information and make decisions in the challenging situations.
10. Employ efficiently and develop the available resources and find new resources.
11. Hold firmly with integrity, credibility and full implementation the ethics of the profession.
12. Transfer knowledge and experience to others.

3-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for PhD degree in Pharmaceutical Sciences (**Microbiology and Immunology)**. **On successful completion of the PhD degree Program, students will be able to:**

3-1- Knowledge and Understanding:

A.1-Describe the features of common microbial pathogens, mechanisms of pathogenesis and describe all diagnostic approaches and test needed to specify and diagnose microbial diseases.

A.2- 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.

A.3- Define the virulence attributes of bacterial pathogens, and their genetic bases and regulation.

A.4- Define the methods of diagnosis of different bacterial, viral and fungal diseases

A.5- Mention the bases of the techniques and tools of traditional and molecular typing of microorganisms

A.6- Recall the ethics of scientific research.

A.7- Outline the ethical and legal aspects in professional practices.

A.8-Outline the principles of quality assurance for different laboratory techniques and methods in diagnosis of diseases.

A.9- Illustrate the influence of microbiology branches, such as diagnostic microbiology, pathogenic bacteriology, and molecular and traditional typing of microorganisms on the community and environment.

3-2 - Intellectual Skills:

B.1- Analyze and interpret data obtained from microbiology research such as diagnosis of infectious diseases, typing of microorganisms and virulence factors of different pathogens and utilize them to help in prevention and treatment of different diseases.

B.2- Suggest significant solutions for problems encountered in microbiology laboratory results and overcome errors based on a wide academic background.

B.3- Conduct applied research to increase and extend the current knowledge in diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms.

B.4- Analyze scientific reports of research in microbiology.

B.5-Evaluate the potential hazards in work environment and how to deal with them effectively.

B.6- Organize an effective laboratory protocol for the required microbiological issue.

B.7- Evaluate the outcome of various therapeutic strategies for treatment of different infectious diseases.

B.8- Select professional decisions in different issues related to microbiological research.

B.9- Innovate knowledge to be applied in treatment of microbial diseases.

B.10- Discuss evidence and logic based scientific discussions on topics in the field of microbiology.

3-3 - Professional and Practical Skills:

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

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

C.3- Apply and use new microbiological techniques and biotechnological tools.

C.4- Develop and validate microbiological techniques and research protocols and assure the quality and suitability of instruments and tools.

C.5- Use efficiently the information technology to improve the professional practice in microbiology.

C.6- Practice self assessment and make assessment of the others' performance to improve the whole performance.

3-4 - General and Transferable Skills:

D.1- Interact effectively with other professionals' partners.

D.2- Command, effectively basic computer skills and IT tools.

D.3- Set criteria for evaluating performance of the others, in the different fields of microbiology.

D.4- Practice self assessment and sustain self learning in the field of microbiology.

D.5- Retrieve and collate 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

4- Academic Standards:

Matrix I: Comparison between PhD degree program ILOs and the **Academic Reference Standard {ARS, 2009} developed by NAQAAE**

	ARS (2009)	Program ILOs
Understanding and	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely	A.1-Describe the features of common microbial pathogens, mechanisms of pathogenesis and describe all diagnostic

	related areas of pharmaceutical sciences.	approaches and test needed to specify and diagnose microbial diseases. A.2- 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. A.3- Define the virulence attributes of bacterial pathogens, and their genetic bases and regulation.
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.4- Define the methods of diagnosis of different bacterial, viral and fungal diseases A.5- Mention the bases of techniques and tools of traditional and molecular typing of microorganisms A.6- Recall the ethics of scientific research.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.7- Outline the ethical and legal aspects in professional practices.
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.8- Outline the principles of quality assurance for different laboratory techniques and methods in diagnosis of diseases.
	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.9- Illustrate the influence of microbiology branches, such as diagnostic microbiology, pathogenic bacteriology, and molecular and traditional typing of microorganisms on the community and 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 such as diagnosis of infectious diseases, typing of microorganisms and virulence factors of different pathogens and utilize them to help in prevention and treatment of different diseases.

	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest significant solutions for problems encountered in microbiology laboratory results and overcome errors based on a wide academic background.
	2.2.3- Conduct research studies that add to the current knowledge.	B.3- Conduct applied research to increase and extend the current knowledge in diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms.
	2.2.4- Formulate scientific papers.	B.4- Analyze scientific reports of research in microbiology.
	2.2.5- Assess hazards and risks in professional practice in his / her area of specialization.	B.5- Evaluate the potential hazards in work environment and how to deal with them effectively.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.6-Organize an effective laboratory protocol for the required microbiological issue. B.7- Evaluate the outcome of various therapeutic strategies for treatment of different infectious diseases.
	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.8- Select professional decisions in different issues related to microbiological research.
	2.2.8- Be creative and innovative.	B.9- Innovate knowledge to be applied in treatment of microbial diseases.
	2.2.9- Manage discussions and arguments based on evidence and logic.	B.10- Discuss evidence and logic based scientific discussions on topics in the field of microbiology.
Professional and Practical Skills	2.3.1- Mastery of basic and modern professional skills in the area of specialization.	C.1- Perform the basic and recent laboratory techniques in microbiological research effectively.
	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- Apply and use new microbiological techniques and biotechnological tools. C.4- Develop and validate microbiological

		techniques and research protocols and assure the quality and suitability of instruments and tools.
	2.3.4- Properly use technological means in a better professional practice.	C.5- Use efficiently the information technology to improve the professional practice in microbiology.
	2.3.5- Plan to improve professional practices and to improve the performance of other scholars.	C.6- Practice self assessment and make assessment of the 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 other professionals' partners.
	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Command, effectively basic computer skills and IT tools.
	2.4.3- Help others to learn and evaluate their performance.	D.3- Set criteria for evaluating performance of the others, in the different fields of microbiology.
	2.4.4- Self- assessment and continuous learning.	D.4- Practice self assessment and sustain self learning in the field of microbiology.
	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve and collate 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.

Matrix II: Comparison between PhD degree program ILOs and the ILOs of PhD of Biomedical Sciences (Immunity & infection), University of Southampton, UK.

	PHD of Biomedical Sciences (Immunity &infection) Program ILOs	Program ILOs
e and Understan	A1. The practical issues involved in carrying out quantitative research	A.2- 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. A.5- Mention the bases of techniques and tools of traditional and molecular typing of microorganisms. A.9- Illustrate the influence of microbiology branches, such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the community and environment.
	A2. The value, nature, uses and limitations of a range of research methods	A.4- Recognize the methods of diagnosis of different bacterial, viral and fungal diseases A.8- Outline the principles of quality assurance for different laboratory techniques and methods in diagnosis of diseases. (**partially covered**)
	A3. Research governance, ethics and data protection principles in scientific research	A.6- Recall the ethics of scientific research A.7- Outline the ethical and legal aspects in professional practices
	A4. The identification and justification of the value of different sources of data in drawing conclusions from published literature	D.5- Retrieve and collate information from various sources in the field of microbiology
	A5. The genetic, cellular, molecular and immunological basis of mechanisms involved in the development of specific disease processes and how these may be adapted/regulated in disease management	A.1-Describe the features of common microbial pathogens, mechanisms of pathogenesis and describe all diagnostic approaches and tests to needed to specify and diagnose microbial diseases. A.3- define the virulence attributes of bacterial pathogens, and their genetic bases and regulation.

Subject Specific Intellectual and Research Skills	B1. Gather, quantify, analyse, synthesise, critically evaluate and interpret complex information	B.1- Analyze and interpret data obtained from microbiology research such as diagnosis of infectious diseases, typing of microorganisms and virulence factors of different pathogens and utilize them to help in prevention and treatment of different diseases. B.7- Evaluate the outcome of various therapeutic strategies for treatment of different infectious diseases.
	B2. Apply scientific and clinical concepts to the development of new ideas and the synthesis of hypotheses	B.9- Create or innovate knowledge to be applied in treatment of microbial diseases. B.10- Discuss evidence and logic based scientific discussions on topics in the field of microbiology
	B3. Analyse problems objectively using key theoretical perspectives and empirical research	B.5- Evaluate the potential hazards in work environment and how to deal with them effectively.. (**partially covered**)
	B5. Demonstrate and exercise independence of mind and thought	B.2- Suggest significant solutions for problems encountered in microbiology laboratory results and overcome errors based on a wide academic background. B.8- Select professional decisions in different issues related to microbiological research.
	B4. Devise valid and reliable methods and instruments for data and information collection in relation to your own research	B.3- Conduct applied research to increase and extend the current knowledge in diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms. B.6-Organize an effective laboratory protocol for the required microbiological issue.
	B6. Defend your research findings in the context of already published work and established paradigms	B.10- Discuss evidence and logic based scientific discussions on topics in the field of microbiology.

Subject Specific Practical Skills	D1. Analyse and reflect critically on your professional role in your area of research	B.4- Analyze scientific reports of research in microbiology C.2- Write professional scientific reports in microbiological research and evaluate them. C.3- Apply and use new microbiological techniques and biotechnological tools.
	D2. Apply investigative skills/methods of enquiry to researching problems and issues in your area of research	C.1- Perform the basic and recent laboratory techniques in microbiological research effectively. C.4- Develop and validate microbiological techniques and research protocols and assure the quality and suitability of instruments and tools. C.5- Use efficiently the information technology to improve the professional practice in microbiology.
Transferable and Generic Skills	C1. Work effectively, independently and with others in groups to achieve identified tasks	D.1- Interact effectively with other professionals' partners. D.6- Work effectively as a member of team
	C3. Use information technology e.g. web/internet, databases, spreadsheets, statistical packages and word processing effectively	D.2- Command, effectively basic computer skills and IT tools.
	Not covered	D.3- Set criteria for evaluating performance of the others, in the different fields of microbiology.
	C2. Identify your personal learning needs effectively and develop personal development plans appropriate to your career aspirations	C.6-Practice self assessment and make assessment of the others' performance to improve the whole performance. D.4- Practice self assessment and sustain self learning in the field of microbiology.
	C4. Present, discuss and defend ideas, concepts and views effectively through written and spoken language	D.5- Retrieve and collate information from various sources in the field of microbiology.
	C5. Manage a research project with due attention to time and resource management	D.7- Manage scientific meetings and get maximum use of time to achieve goals.

5-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	Diagnostic Microbiology	4	A1, A9, B1, D2, D4, D6, D7
Isp5	Molecular & Traditional Typing of	4	A2, A5, A9, B8, D2, D4, D5, D6, D7

	Microorganisms		
Isp6	Pathogenic Bacteriology	4	A3, A8, A9, B1, D2, D4, D5, D6, D7
	Thesis	30	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, C1, C2, C3, C4, C5, C6, D1, D2, D3, D4, D5, D6 & D7

6-Program admission requirements:

Applicants are admitted to PhD degree any time throughout the academic year upon fulfillment of the following:

1. The applicants should be holders of Bachelor in Pharmaceutical Sciences from any Faculty of Pharmacy and also finish M.Sc. degree offered by any Faculty of Pharmacy of the Egyptian Universities affiliated to the Egyptian Supreme Council of Universities (ESCU).
2. Students should fulfill all the admission requirements stated by the concerned Departmental Board.

Regulations to complete the program:

Conditions of granting the degree

The Faculty Council, in compliance with the concerned Departmental Board as well as Graduate Studies and Research Committee recommendation awards the PhD degree upon fulfillment of the following requirements:

1. Carrying out a deep research in the area of specialization for at least two calendar years from the time of registration.

2. The student has to succeed in all courses examinations.
3. Acceptance of the research thesis by the judges Committee according to statement 104 of universities regulating law.

Cancellation of Registration

The Faculty Board is allowed to cancel registration for PhD programs in the following circumstances:

1. Student's failure to pass the course examinations for two times.
2. Student's nonattendance or unsatisfactory progress in research work being reported by the advisors to the Departmental Board and forwarded to the Graduate Studies and Research Committee for approval of cancellation.
3. Dissertation refusal by the Jury Committee.
4. Incapability of the student to graduate by the deadlines indicated

7- Admission Policy:

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

8-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%

9-Failure in Courses:

Students who fail to get 60% (1 point)

10-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Prof. Dr. Fathy Serry	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Prof. Dr. Tarek El-Bana	Program evaluation Courses evaluation	Program report Courses report

Candidate and stakeholders	Questionnaires	Results of the questionnaires
Others methods	Matrix with ARS	The Matrix

Program coordinator **Head of Department**

Prof. Dr. Fathy M Serry **Prof. Dr. Nehal El-sayed**

Diagnostic Microbiology

Course Specification of Diagnostic Microbiology

Course specifications:

- **Program on which the course is given:** PhD Pharm Sci (Microbiology and Immunology).
- **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:** September 2019

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 understand in details the features of common microbial pathogens and the mechanisms of pathogenesis, the regulations, frequency, transportation and processing of the clinical specimens obtained from the different sites of infections, the taxonomic classification of pathogenic microorganisms and all diagnostic approaches and tests needed to specifically identify microorganisms and diagnose diseases.

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

A-Knowledge and Understanding	
a1	Recognize the detailed essential features of different types of microorganisms and the diagnostic methods for their identification.
a2	Demonstrate in depth the knowledge of systematic classification of 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
b2	Select or suggest the most appropriate tests for proper identification of microorganisms in minimum steps.
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.
d5	Prepare a presentation on a relevant topic

4-Course content of Diagnostic Microbiology:

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

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion
- Critical thinking

6-Student Assessment methods:

- Written exam to assess: a1, a2, a3, b1, b2
- Oral exam to assess: a1, a2, a3, b1, b2
- Activity to assess: d1, d2, d3, d4, d5

Assessment schedule:

Assessment (1): Activity	Week 8,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books

A – Scientific papers

B- Essential Books

1. Elmer W. Koneman, Stephen D. Allen, William M. Janda, Paul C. Schreckenberger, Washington C, (2006). Winn. Color Atlas and Textbook of Diagnostic Microbiology, 6th edition.Lippincott.
2. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, (2015). Medical Microbiology, 8th ed. (Philadelphia: Elsevier/Mosby.
3. Levinson, W, (2006). Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill).

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**, EKB**

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Mona Abdelmonem El-Sayed**
- **Head of Department: Prof Dr/ Nehal E-l-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Diagnostic Microbiology (2019)

Course Contents		ILOs of Diagnostic Microbiology course									
		Knowledge & understanding			Intellectual skills		General and transferable skills				
		a1	a2	a3	b1	b2	d1	d2	d3	d4	d5
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	Classification and differentiation between the members of The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase +ve fermenters.	x		x	x	x					
7	Laboratory diagnosis and differentiation of Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.	x		x	x	x					
8	Activity						x	x	x	x	x
9	Classification and differentiation of the Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.The aerobic Gram+ve bacilli, The anaerobic bacteria	x		x	x	x					
10	Diagnosis of Mycoplasma and ureaplasma, Myxobacteria	x		x	x	x					
11	Diagnosis of Spirochaetal infections	x		x	x	x					
12	Mycology and Parasitology (Diagnosis of infections caused by fungi and parasites)	x		x	x	x					
13	Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.	x		x	x	x					
14	Students presentations and open discussion	x	x	x	x	x	x	x	x	x	

Matrix II of Diagnostic microbiology (2019)

ARS (2009)		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-Describe the features of common microbial pathogens, mechanisms of pathogenesis and describe all diagnostic approaches and tests needed to specify and diagnose microbial diseases.	**a1, a2**	Basic bacteriological concepts of virulence and technologic advances in clinical microbiology.	**Textbook, Scientific papers and self learning**	**X**	**X**	**x**	**x**	
				Basic bacterial anatomy and physiology, virulence pathogenicity, and technologic advances in clinical microbiology, immunologic methods		**X**	**X**	**x**	**x**	
				Role of microbiology laboratory in diagnosis of infectious diseases		**X**	**X**	**x**	**x**	
				Guidelines for collection, transport, processing, analysis and reporting of cultures from specific specimen sources.		**X**	**X**	**x**	**x**	
				Classification and differentiation between the members of The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and		**X**	**x**	**x**	**x**	

				oxidase positive fermenters.						
				Laboratory diagnosis and differentiation of Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.		**X**	**X**	**x**	**x**	
				Classification and differentiation of the Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria.The aerobic Gram+ve bacilli, The anaerobic bacteria		**X**	**X**	**x**	**x**	
				Diagnosis of Mycoplasma and ureaplasma, Myxobacteria		**X**	**X**	**x**	**x**	
				Diagnosis of Spirochaetal infections		**X**	**X**	**x**	**x**	
				Mycology and Parasitology (Diagnosis of infections caused by fungi and parasites)		**X**	**X**	**x**	**x**	
				Diagnosis of infections caused by viruses,		**X**	**x**	**x**	**x**	

				Chlamydia, Rickettsia, and related organisms.						
				Revision		**X**	**X**	**x**	**x**	
				Students presentations and 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.9- Apprehend the influence of microbiology branches, such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the community and 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**	
				Classification and differentiation between the members of The Enterobacteriaceae, the non-fermentative Gram –ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.		**X**	**X**	**x**	**x**	
				Laboratory diagnosis and differentiation of Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.		**X**	**X**	**x**	**x**	

				Classification and differentiation of the The Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria. The aerobic Gm+ve bacilli and anaerobic bacteria		**X**	**X**	**x**	**x**	
				Diagnosis of Mycoplasma and ureaplasma, Myxobacteria		**X**	**X**	**x**	**x**	
				Diagnosis of Spirochaetal infections		**X**	**X**	**x**	**x**	
				Mycology and Parasitology (diagnosis of infections caused by fungi and parasites)		**X**	**X**	**x**	**x**	
				Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.		**X**	**X**	**x**	**x**	
				Revision		**X**	**X**	**x**	**x**	
				Students presentations and 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	B.1- Analyze and interpret data obtained from microbiology research such as	b1, b2	Classification and differentiation between the members of The Enterobacteriaceae, the non-fermentative Gram –	Textbooks, Scientific papers and self learning	**X**	**x**	**x**	**x**	

	(induction/deduction).	diagnosis of infectious diseases, typing of microorganisms and virulence factors of different pathogens and utilize them to help in prevention and treatment of different diseases.		ve bacilli, and curved Gram –ve bacilli and oxidase positive fermenters.						
				Laboratory diagnosis and differentiation of Haemophilus, Miscellaneous fastidious Gram –ve bacilli, Legionella, Neisseria species and Moraxella catarrhalis.		**X**	**X**	**x**	**x**	
				Classification and differentiation of Gram +ve cocci: Staphylococci and related organisms, Streptococci, Enterococci and streptococcus-like bacteria. The aerobic Gm+ve bacilli and anaerobic bacteria		**X**	**X**	**x**	**x**	
				Diagnosis of Mycoplasma and ureaplasma, Myxobacteria		**X**	**X**	**x**	**x**	
				Diagnosis of Spirochaetal infections		**x**	**X**	**x**	**x**	
				Mycology and Parasitology (Diagnosis of infections caused by fungi and parasites)		**x**	**X**	**x**	**x**	

				Diagnosis of infections caused by viruses, Chlamydia, Rickettsia, and related organisms.		x	X	x	x	
				Revision		x	X	x	x	
				Students presentations and open discussion		x	X	x	x	
2.4	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Command, effectively basic computer skills and IT tools.	d1, d5	Activity	Textbooks, Scientific papers and self learning		X			x
	2.4.4- Self- assessment and continuous learning.	D.4- Practice self assessment and sustain self learning in the field of microbiology.	d4	Activity	Textbooks, Scientific papers and self learning		X			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 meeting 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 Specification of Molecular and Traditional Typing of Microorganisms

Course specifications:

- **Program on which the course is given:** PhD Pharm Sci (Microbiology and Immunology)
- **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:** 2019

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 microorganisms, 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):

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	Define 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	Identify 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 No.	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 (student presentation)
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	Students presentations and open discussion
15	Written exam

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion
- Critical thinking

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 6,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books

A –Scientific papers

1. Aanensen, DM & BG. Spratt (2005).The multilocus sequence typing network: mlst.net. *Nucleic. Acids Res.* 33(Web Server issue): W728-33.1362-4962
2. Albarracin Orio, AG., PR Cortes, M Tregnaghi, GE Pinas & JR. Echenique (2008).A new serotype 14 variant of the pneumococcal Spain9V-3 international clone detected in the central region of Argentina. *J. Med. Microbiol.* 57(Pt 8): 992-9.0022-2615
3. van Belkum A, Tassios PT, Dijkshoorn L, Haeggman S, Cookson B, Fry NK, et al. Guidelines for the validation and application of typing methods for use in bacterial epidemiology. Clin Microbiol Infect. 2007;13 Supp. 3
4. Tenover FC, Arbeit RD, Goering RV, Mickelsen PA, Murray BE, Persing DH, et al. Interpreting chromosomal DNA restriction patterns produced by pulsed-field gel electrophoresis: criteria for bacterial strain typing. J Clin Microbiol. 1995;33(9):2233-9.
5. Tosh PK, Disbot M, Duffy JM, Boom ML, Heseltine G, Srinivasan A, et al. Outbreak of Pseudomonas aeruginosa surgical site infections after arthroscopic procedures: Texas, 2009. Infect Control Hosp Epidemiol. 2011;32(12):1179-86.

B- Essential books

1) Dijkshoorn L, Towner KJ, & Struelens MJ. (2001).*New approaches for the generation and analysis of microbial typing data*. (1st Eds.). Elsevier.
2) Turgeon, M. L. (2013). *Immunology & Serology in Laboratory Medicine-E-Book*. Elsevier Health Sciences.
3) Tang, Y. W. (2015). *Molecular medical microbiology*. (2nd edition) Academic press.

C –Suggested papers

1. Goering RV. Pulsed field gel electrophoresis: a review of application and interpretation in the molecular epidemiology of infectious disease. Infect Genet Evol. 2010;10(7):866-75.
2. Vos P, Hogers R, Bleeker M, Reijans M, van de Lee T, Hornes M, et al. AFLP: a new technique for DNA fingerprinting. Nucleic Acids Res. 1995;23(21):4407-14.
3. Mortimer P, Arnold C. FAFLP: last word in microbial genotyping? J Med Microbiol. 2001;50(5):393-5.
4. Li W, Raoult D, Fournier PE. Bacterial strain typing in the genomic era. FEMS Microbiol Rev. 2009;33(5):892-916.
5. Versalovic J, Schneider M, de Bruijn FJ, Lupski JR. Genomic fingerprinting of bacteria using the repetitive sequence-based polymerase chain reaction. Methods Mol Cell Biol. 1994;5(1):25–40.
6. Healy M, Huong J, Bittner T, Lising M, Frye S, Raza S, et al. Microbial DNA typing by automated repetitive-sequence-based PCR. J Clin Microbiol. 2005;43(1):199-207.
7. Deplano A, Denis O, Rodriguez-Villalobos H, De Ryck R, Struelens MJ, Hallin M. Controlled performance evaluation of the DiversiLab repetitive-

sequence-based genotyping system for typing multidrug-resistant health care-associated bacterial pathogens. J Clin Microbiol. 2011;49(10):3616-20.

8. Fluit AC, Terlingen AM, Andriessen L, Ikawaty R, van Mansfeld R, Top J, et al. Evaluation of the DiversiLab system for detection of hospital outbreaks of infections by different bacterial species. J Clin Microbiol. 2010;48(11):3979-89.
9. Overdevest IT, Willemsen I, Elberts S, Verhulst C, Rijnsburger M, Savelkoul P, et al. Evaluation of the DiversiLab typing method in a multicenter study assessing horizontal spread of highly resistant gram-negative rods. J Clin Microbiol. 2011;49(10):3551-4.
10. Babouee B, Frei R, Schultheiss E, Widmer AF, Goldenberger D. Comparison of the DiversiLab repetitive element PCR system with spa typing and pulsed-field gel electrophoresis for clonal characterization of methicillin-resistant Staphylococcus aureus. J Clin Microbiol. 2011;49(4):1549-55

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience, EKB

Facilities required for teaching and learning:

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

- **Course Coordinators: Dr/ Amira El-Ganiny**
- **Head of Department: Prof Dr/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Molecular and traditional typing of microorganisms (2019)										
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	Students presentations and Open discussion	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**X**

Matrix II of Molecular and traditional typing of microorganisms (2019)

ARS (2009)		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.2- 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.	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 (NA) 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, PFGE, Southern Blotting		x	x	x	x	
				NA based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification		x	x	x	x	
				NA based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA		x	x	x	x	
				NA amplification techniques transcription based amplification system (TAS), ligase chain reaction (LCR), Qß Replicase system.		x	x	x	x	

				NAamplification 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**	
				Students presentations and Open discussion		**x**	**x**	**x**	**x**	x
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.5- Understand the bases of the techniques and tools of traditional and molecular typing of microorganisms	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	
				NA based typing systems: plasmid chromosomal DNA analysis, restriction enzyme patterns and ribotyping,						
				Chromosomal DNA analysis: restriction endonuclease analysis of chromosomal DNA, Pulsed Field Gel Electrophoresis (PFGE), Southern Blotting		**x**	**x**	**x**	**x**	
				NA based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification		**x**	**x**	**x**	**x**	

				NA based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA NA 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**	
				Students presentations and Open discussion		**x**	**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	A.9- Apprehend the influence of microbiology branches, such as diagnostic microbiology, pathogenic	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**	

	conservation and development.	bacteriology and molecular and traditional typing of microorganisms on the community and environment.		NA 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, PFGE, Southern Blotting		**x**	**x**	**x**	**x**	
				NA based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification		**x**	**x**	**x**	**x**	
				NA based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA		**x**	**x**	**x**	**x**	
				NA 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**	

				Students presentations and Open discussion		**x**	**x**	**x**	**x**	x
2.2	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.8- Take professional decisions in different issues related to microbiological 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**	
				NA 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, PFGE, Southern Blotting		**x**	**x**	**x**	**x**	
				NA based typing systems by hybridization methods, nucleic acid probes, branched DNA signal amplification		**x**	**x**	**x**	**x**	
				NA based typing systems after amplification by PCR: RT-PCR, nested PCR, multiplex PCR, broad range PCR, Random Amplified Polymorphic DNA		**x**	**x**	**x**	**x**	
				NA 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**	
				Students presentations and Open discussion		x	**x**	**x**	**x**	x
2.4	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Command, effectively basic computer skills and IT tools.	d1	Activity	Textbooks, Scientific papers and self learning		**x**			**x**
	2.4.4- Self-assessment and continuous learning.	D.4- Practice self assessment and sustain self learning in the field of microbiology.	d2	Activity	Textbooks, Scientific papers and self learning		**x**			**x**
	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve and collate 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 and lead a team of workers.	D.6- Work effectively as a member of team.	d4	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	d5	Activity	Textbooks, Scientific papers and self learning		**x**			**x**

Pathogenic Bacteriology

Course Specification of Advanced Pathogenic Bacteriology

Course specifications:

- **Program on which the course is given:** PhD in Pharm Sc. (Microbiology and Immunology)
- **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:** 2019

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, the genetic and molecular regulation of virulence factors, the interactions of virulence factors with the host, 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	State in depth the mechanisms by which the pathogens can induce the infections
a3	Outline the effect of pathogenic bacteriology on the environment
B- Intellectual skills	
b1	Evaluate and interpret data obtained from pathogenic bacteriology 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 pathogenic bacteriology.
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 No.	Lecture content (4 hours/week)
1	Biochemical basis of host and tissue specificity
2	Role of iron in infectious diseases
3	Mechanisms of attachment and adherence of pathogenic Gm+ve and Gm-ve bacteria to the receptors on the epithelial cells of host tissues which are important for adherence of bacteria
4	The survival of bacteria within phagocytes
5	Role of indigenous microflora of the gastrointestinal tract in resistance to the infectious diseases (mechanisms by which the indigenous microflora inhibit pathogens and remain constant).
6	Determinants of virulence in anaerobic bacteria Plasmids and genetic determinants which contribute to bacteria pathogenicity
7	Activity
8	Genetic regulation and mechanisms of natural resistance to infectious diseases
9	Tissue injury by bacterial pathogens: exotoxins, endotoxins and non-specific immunity
10	Some major exotoxins
11	Organisms of medical interest. e.g. mechanisms of complications caused by sexually transmitted diseases such as gonorrhea and syphilis
12	Emerging bacterial pathogens. e.g. *Legionella*
13	Pathogenesis of bacterial endocarditis
14	Students presentations and open discussion
15	Written exam

5-Teaching and Learning Methods:

- Lectures (overhead project, data show, board)
- Self learning (internet search.....)
- Open discussion
- Critical thinking

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, 14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books:

A – Handouts and scientific papers.

B- Essential books

1. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 5th ed. (Philadelphia: Elsevier/Mosby, (2005).

2. Levinson, W. Review of Medical Microbiology and Immunology, 9th ed. LANGE REVIEW SERIES (NY: McGraw-Hill, 2006).
3. Brooks, G.F.; Carroll, K. C.; Butel, J.S.; Morse, S. A. (2007): Jawetz, Melnick and Adelberg's Medical Microbiology. 24th ed. McGraw-Hill.
4. Infectious Disease: A Clinical Short Course by F.S. Southwick, McGraw-Hill, 2007.
5. Cappuccino and James, G (1996), Microbiology a laboratory manual, Addison Wesley Publishing Company Inc. 4th edition, England, California.
6. 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.
7. Topley & Wilson's (1995). Text Book on principles of Bacteriology, Virology and Immunology IX Edition, Edward Arnold, London.
8. 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**, EKB**

Facilities required for teaching and learning

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

- **Course Coordinators: Prof Dr/ Mona Abdelmonem**
- **Head of Department: Prof Dr/ Nehal El-sayed**
- **Date: 2019 تم اعتماد توصيف المقرر بمجلس القسم لشهر سبتمبر**

Matrix I of Pathogenic bacteriology (2019)

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	x		X					
2	Role of iron in infectious diseases	x	x		X					
3	Mechanisms of attachment and adherence of pathogenic Gm+ve and Gm-ve bacteria to the receptors on the epithelial cells of host tissues which are important for adherence of bacteria	x	x	x	X					
4	The survival of bacteria within phagocytes	x	x	x	x					
5	Role of indigenous microflora of the gastrointestinal tract in resistance to the infectious diseases (mechanisms by which the indigenous microflora inhibit pathogens and remain constant).	x	x	x	x					
6	Determinants of virulence in anaerobic bacteria Plasmids and genetic determinants which contribute to the bacteria pathogenicity	x	x	x	x					
7	Activity					x	X	x	x	x
8	Genetic regulation and mechanisms of natural resistance to infectious diseases.	x	x	x	x					
9	Tissue injury by bacterial pathogens: exotoxins, endotoxins and non-specific immunity	x	x	x	x					
10	Some major exotoxins	x	x	x	x					
11	Organisms of medical interest. e.g. mechanisms of complications caused by sexually transmitted diseases such as gonorrhea and syphilis	x	x	x	x					
12	Emerging bacterial pathogens. e.g. Legionella	x	x	x	x					
13	Pathogenesis of bacterial endocarditis	x	x	x	x					
14	Students presentations and open discussion	x	x	x	x	x	X	x	x	x

Matrix II of Pathogenic bacteriology (2019)

ARS (2009)		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.3- Recognize the virulence attributes of bacterial pathogens, and their genetic bases and regulation.	**a1**	Biochemical basis of host and tissue specificity	Textbooks, Scientific papers and self learning	x	X	x	x	
				Role of iron in infectious diseases		x	x	x	x	
				Mechanisms of attachment and adherence of pathogenic Gm+ve and Gm-ve bacteria to the receptors on the epithelial cells of host tissues which are important for adherence of bacteria		x	x	x	x	
				The survival of bacteria within phagocytes		x	x	x	x	
				Role of indigenous microflora of the gastrointestinal tract in resistance to the infectious diseases (mechanisms by which the indigenous microflora inhibit pathogens and remain constant).		x	x	x	x	

			Determinants of virulence in anaerobic bacteria 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	
			Some major exotoxins		x	X	x	x	
			Organisms of medical interest. e.g. mechanisms of complications caused by sexually transmitted diseases such as gonorrhea and syphilis		x	X	x	x	
			Emerging bacterial pathogens. e.g. Legionella		x	X	x	x	
			Pathogenesis of bacterial endocarditis		x	X	x	x	
			Revision		x	X	x	x	
			Students presentations and open discussion		x	X	x	x	x
	2.1.4- The principles and bases of quality assurance in	A.8-Perceive and apply the principles of quality assurance	a2	Biochemical basis of host and tissue specificity	Textbooks, Scientific papers and	x	X	x	x	

	professional practice in the field of specialization.	for different laboratory techniques and methods in diagnosis of diseases.		Role of iron in infectious diseases	self learning	x	X	x	x	
				Mechanisms of attachment and adherence of pathogenic Gm+ve and Gm-ve bacteria to the receptors on the epithelial cells of host tissues which are important for adherence of bacteria		x	X	x	x	
				The survival of bacteria within phagocytes		x	X	x	x	
				Role of indigenous microflora of the gastrointestinal tract in resistance to the infectious diseases (mechanisms by which the indigenous microflora inhibit pathogens and remain constant).		x	X	x	x	
				Determinants of virulence in anaerobic bacteria 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	
			Some major exotoxins		x	X	x	x	
			Organisms of medical interest. e.g. mechanisms of complications caused by sexually transmitted diseases such as gonorrhea and syphilis		x	X	x	x	
			Emerging bacterial pathogens. e.g. Legionella		x	X	x	x	
			Pathogenesis of bacterial endocarditis		x	X	x	x	
			Revision		x	X	x	x	
			Students presentations and open discussion		x	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.9- Apprehend the influence of microbiology branches, such as diagnostic microbiology, pathogenic bacteriology and molecular and traditional typing of microorganisms on the community and environment.	a3	Mechanisms of attachment and adherence of pathogenic Gm+ve and Gm-ve bacteria to the receptors on the epithelial cells of host tissues which are important for adherence of bacteria	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 tract in resistance to the		x	X	x	x	

				infectious diseases (mechanisms by which the indigenous microflora inhibit pathogens and remain constant).						
				Determinants of virulence in anaerobic bacteria 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	
				Some major exotoxins		x	x	x	x	
				Organisms of medical interest. e.g. mechanisms of complications caused by sexually transmitted diseases such as gonorrhea and syphilis		x	x	x	x	
				Emerging bacterial pathogens. e.g. Legionella		x	x	x	x	
				Pathogenesis of bacterial endocarditis		x	x	x	x	
				Revision		x	x	x	x	

				Students presentations and open discussion		x	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 such as diagnosis of infectious diseases, typing of microorganisms and virulence factors of different pathogens and utilize them to help in prevention and treatment of different diseases.	b1	Organisms of medical interest		x	x	x	x	
				Biochemical basis of host and tissue specificity		x	x	x	x	
				Role of iron in infectious diseases		x	x	x	x	
				Mechanisms of attachment and adherence of pathogenic Gm+ve and Gm-ve bacteria to the receptors on the epithelial cells of host tissues which are important for adherence of bacteria		x	x	x	x	
				The survival of bacteria within phagocytes		x	x	x	x	
				Role of indigenous microflora of the gastrointestinal tract in resistance to the infectious diseases (mechanisms by which the indigenous microflora inhibit pathogens and remain constant).		x	x	x	x	

				Determinants of virulence in anaerobic bacteria 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	
				Some major exotoxins		x	x	x	x	
				Organisms of medical interest. e.g. mechanisms of complications caused by sexually transmitted diseases such as gonorrhea and syphilis		x	x	x	x	
				Emerging bacterial pathogens. e.g. Legionella		x	x	x	x	
				Pathogenesis of bacterial endocarditis		x	x	x	x	
				Revision		x	x	x	x	
				Students presentations and open discussion		x	x	x	x	x

2.4	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Command, effectively basic computer skills and IT tools.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.4- Self- assessment and continuous learning.	D.4- Practice self assessment and sustain self learning in the field of microbiology.	d2	Activity			x			x
	2.4.5- Use various sources to get information and knowledge.	D.5- Retrieve and collate information from various sources in the field of microbiology.	d3	Activity			x			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			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			x

Thesis Specification

Thesis of PhD Degree

A- Thesis specifications:

- **Program on which the course is given:** PhD of Pharmaceutical sciences (Microbiology and Immunology)
- **Major or Minor element of program:** Major
- **Department offering program:** Microbiology & immunology
- **Department offering thesis:** Microbiology & Immunology Dept.
- **Date of specification approval:** September 2019

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 and draw conclusions about the contribution to knowledge made by the study. The PhD thesis involves self directing research on undiscovered area applying the learned research tools and self designed protocol to solve the problem and to add new information in the field of the study and the thesis is required to represent addition to the science or the knowledge (innovation)

3- Intended learning outcomes (ILOs):

Knowledge and Understanding	
a1	Recall the university and the institutional (Faculty) research plan to choose the research area which he/ she is going to fit with
a2	Define the research proposal objectives
a3	Demonstrate fundamentals and advances of microbiological aspects related to main objectives of the dissertation
a4	Define recent techniques, methods in microbiological work correlated to the objectives which will be implemented in the dissertation
a5	Understand the legal and moral aspects for professional and academic practices as well as ethics of scientific research
a6	Define GLP and quality assurance bases related to practical work in microbiological laboratories
a7	Illustrate the outcomes of the research proposal on the university, community and 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 and be able to transfer skills and information to other members of the 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 the available information about this point by all the 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 are determined in the protocol. Integrate different knowledge (Microbiology, pharmacological knowledge, biostatistics, histology ……..) to solve the suggested problem. Evaluate the thesis outcome continuously 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 the manufacturer

	instructions. Evaluate and manage hazards (chemical and biological) throughout the whole practical work. Organize the experimental work according to the designed protocol (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 the appropriate statistical analysis and biological correlation for the results. Present and describe the results graphically. Suggest solution to the problem understudy based on 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 Write and publish scientific papers either in local or international journal.

5- Teaching and Learning Methods:

- Self learning (Activities, Research….)
- Open discussion
- Problem solving
- Critical thinking
- seminars

6- References:

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

Facilities required for:

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

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- **Head of Department: Prof. Dr. Nehal El-sayed**
- **Date: 2018 تم اعتماد توصيف الرسالة بمجلس القسم بتاريخ سبتمبر**

Program Matrix of PhD degree of Microbiology and Immunology

Program content		Program ILOs																														
		Knowledge and Understanding									Intellectual skills										Professional and practical skills						General and Transferable skills						
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	B 1	B 2	B 3	B 4	B 5	B 6	B 7	B 8	B 9	B1 0	C 1	C 2	C 3	C 4	C 5	C6	D 1	D 2	D 3	D 4	D 5	D 6	D 7
Special courses	Diagnostic Microbiology	X								X	X																	X		X		X	X
	Molecular & Traditional Typing of microorganisms		X			X				X								X										X		X	X	X	X
	Advanced Pathogenic Bacteriology			X					X	X	X																		X		X	X	X	X
Thesis		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X