

# Faculty of Pharmacy and Drug Manufacturing

Pharos University in Alexandria



## Program Specification Bachelor's Degree in Pharmacy

(2006)

إعتماد مجلس وحدة 10/8/2020

إعتماد مجلس كلية 12/8/2020



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**University:** Pharos University in Alexandria

**Faculty:** Faculty of Pharmacy and Drug Manufacturing

## Program Specification

### (A) Basic Information:

1- Program Title: Bachelor's Degree in Pharmacy

2- Program Type: Single  Double  Multiple

3- Department (s) According to the Bylaw of 2006:

- Department of Drug Industries
- Department of Pharmaceutics
- Department of Analytical and Pharmaceutical Chemistry
- Department of Pharmacognosy and Medicinal Plants
- Department of Microbiology and Immunology
- Department of Pharmacology and Toxicology

• Program Coordinator: Prof. Dr. Rasha El-Bayaa

• Date of Program Approval: 12/8/2020

• External Reviewer: Prof. Dr. Salwa Elmeligie

### (B) Special Information:

#### 1. Program Aims:

The principal aim of the program of Faculty of Pharmacy and Drug Manufacturing, Pharos University in Alexandria, is to:

- a) Graduate competent pharmacists in the local, national and international markets.
- b) Provide pharmacy students with multidisciplinary well-structured program, including basic, pharmaceutical, medical, pharmacy practice, social, behavioral, pharmaceutical management, health and environmental elements.
- c) Promote students to acquire advanced knowledge, practice experience and skills that enable them to solve different problems concerning pharmaceutical health care, drug industry and community services as well as contributing in academic research institutes.
- d) Prepare graduates to assume positions as educators and scientists in academic, industry, and/or government settings.



### **Graduate Attributes:**

**Faculty of Pharmacy and Drug Manufacturing, Pharos University in Alexandria strives to ensure that graduates of the program acquire and demonstrate the following attributes:**

- 1. Perform efficiently, professionally, legally and ethically in different areas of pharmacy practice.**
- 2. Demonstrate prudence in handling chemicals and pharmaceutical, natural products as well as microbes by applying basic of aseptic techniques.**
- 3. Deliver pharmaceutical care to patients in community pharmacies and in hospital settings.**
- 4. Adhere to good laboratory practice in performing chemical, analytical, microbiological and biological procedures and techniques.**
- 5. Adhere to good manufacturing practices in formulating, preparing and storing pharmaceutical and natural products.**
- 6. Participate in delivering education services to the public with other health care professionals aiming to promote health, control infection and prevent disease.**
- 7. Demonstrate good understanding of the etiology, pathophysiology and management of different diseases in accordance with evidence-based medicine.**
- 8. Propose good judgment in resolving drug-related problems and promoting rational use of medicines, as well as Planning, designing, and conducting research using appropriate methodologies.**
- 9. Develop competence in assuring quality of raw material and pharmaceutical as well as natural products including physical, chemical, microbiological and biological quality control.**
- 10. Be committed to life-long learning, and strive continuously to update their knowledge in profession-related areas.**
- 11. Demonstrate good communication and computation skills, time management, problem solving, critical thinking, decision-making proper documentation and drug filling system and team-working spirit.**
- 12. Be committed to further develop presentation, documentation, promotion, marketing and business administration skills.**



## 2. Intended Learning Outcomes (ILOs):

### 2.1. Knowledge and Understanding:

By completion of the program, students should be able to:

- A1: Explain fundamentals of basic physicochemical behavior of compounds and drugs, pharmacy practice, pharmaceutical management as well as pharmaceutical, medical, social, behavioral, health and environmental sciences.**
- A2: Identify qualitative and quantitative principles of different chemical compounds and various analytical techniques applying GLP guidelines including aseptic technique and different validation procedures.**
- A3: Recognize techniques used for isolation, identification, purification, synthesis and standardization of active substances derived from different origins.**
- A4: Outline characteristics of different drug dosage forms, cosmetic preparations and biotechnology derived pharmaceuticals, their troubleshooting (delivery systems) causes and remedies.**
- A5: Recall quality assurance of pharmaceutical processes and products including physical, chemical, microbiological and biological quality control as well as quality control of herbal products.**
- A6: Explain factors affecting drug pharmacokinetics, bioavailability and bioequivalence aspects.**
- A7: Identify the principles of pharmaceutical technology such as pre-formulation and powder characterization.**
- A8: Describe basics of appropriate documentation, methodology and approval process of newly introduced pharmaceutical products.**
- A9: Define legal background for national drug policy and regulations of pharmacy practice based on national code of ethics.**
- A10: Recognize the basic idea behind GMP and its requirements for both quality management and personnel, including principles of various instruments and techniques including all processes in pharmaceutical industry.**
- A11: Identify the principles of engineering and pharmaceutical science in drug innovation, design, development, construction and operation of plants based on physicochemical characteristics of drug entity and drug receptor interactions.**



- A12: Describe administrative and technical services at the hospital setting; IV admixtures, parenteral nutrition, drug dispensing, distribution, preparation and administration.**
- A13: Identify causes and control of microbial contamination as well as sanitation, disinfection, sterilization processes and microbiological quality control of pharmaceutical products for maintaining public health.**
- A14: Describe fundamentals of anatomy, physiology of human body, pathophysiology and manifestations of diseases in addition to general principles of nutrition and its relation to health and disease.**
- A15: Explain the basis of pharmacogenetics and genetic predisposition to disease, the fundamentals of immunology, biotechnology and biochemical pathways of molecular biology and radio labeled pharmaceutical products regarding their correlation with different diseases.**
- A16: Discuss etiology, epidemiology and laboratory diagnosis for different disease states, in addition to the host microbe relationship and basis of inflammation and infectious disease.**
- A17: Describe mechanisms of action, therapeutic uses, dosage regimes, adverse drug reactions, drug interactions and contraindication of pharmacologically active drugs of natural or synthetic origins as well as antimicrobial agents.**
- A18: Review the general principles of clinical pharmacology, features of therapeutic drug monitoring and rational use of drugs.**
- A19: Explain rational for the use of complementary and alternative medicine.**
- A20: Describe toxicological features of drugs and xenobiotics and their management as well as major therapeutic guidelines.**
- A21: Explain basics of mathematics and principles of biostatistical analysis and their applications in different pharmaceutical fields.**
- A22: Summarize fundamentals of pharmaceutical management, including financial and human resources**
- A23: Describe primary, secondary and tertiary drug information resources.**
- A24: Recognize principles of sales and marketing as well as drug promotion**



## **2.2. Intellectual Skills:**

By completion of the program, students should be able to:

- B1: Illustrate the acquired knowledge and terminology in calculation, preparing, analyzing and formulating compounds, medicines and cosmetic preparations effectively.**
- B2: Predict the properties of biomolecules and medicinal agents as well as their structure-activity relationship and potency by application of various studies including bioinformatics and other computer-aided tools in drug design.**
- B3: Make use of medical and pharmaceutical calculation as well as statistics for estimation and data interpretation of experimental results and published literature.**
- B4: Apply GLP, GMP, GSP and GCP guidelines in the different areas of pharmacy practices, as well as measures of infection control.**
- B5: Discover the appropriate design and strategies of targeting drug delivery systems and technologies of biologically active molecules.**
- B6: Select the proper radionuclide and type of imaging device required for detecting various diseases.**
- B7: Identify pharmacological actions, adverse drug reactions, drug interactions, contraindications as well as drug incompatibilities and drug instability intervene to manage and resolve different diseases and problems.**
- B8: Predict the changes in the pharmacokinetic processes on the concentration of the drug in the body.**
- B9: Assess evidence-based information, ethical and legislation frameworks needed in pharmacy practice decisions to prevent medication errors in addition to adjust dosage and dose regimen.**
- B10: Discover different problems of manufacturing and dispensing of the different dosage forms and their solutions**
- B11: Select the optimum and validated method of manufacturing of the dosage form.**
- B12: Select appropriate tools or analytical method for the assay and quality control of raw materials and pharmaceutical products.**
- B13: Differentiate processes in which materials undergo physical changes (unit operations) or certain chemical changes (unit processes).**



- B14:** Employ physical, analytical and microscopic methods for qualitative and quantitative analysis for medicines in different forms.
- B15:** Choose appropriate methods of synthesis, extraction, identification, isolation, purification and standardization of natural products, as well as biologically active pharmaceutical and toxic substances.
- B16:** Compare between different disease states with respect to their etiology, epidemiology, laboratory diagnosis, clinical features and pharmacotherapeutics aspects of the disease.
- B17:** Apply pharmacological, pharmacogenomics, pharmacoimmunology pharmacotherapeutics and clinical pharmacy principles for the proper selection of drugs to include in formulary and for management of individual patients.
- B18:** Develop cost-effective pharmacotherapy management for application of principles of pharmaceutical management, sales and marketing, and taxes in different pharmaceutical fields.
- B19:** Calculate different indices important for manufacturing of solid dosage form.
- B20:** Relate social and behavioral activities, nutritional status as well as environmental problems on human health.
- B21:** Choose measures of infection control to prevent infections

### **2.3. Professional and Practical Skills:**

By completion of the program, students should be able to:

- C1:** Apply pharmaceutical and medical knowledge, terms & abbreviations correctly in different professional settings.
- C2:** Develop good laboratory practice in handling and disposing chemicals, natural products and microbial specimen in a manner ensuring safety of individuals and environment.
- C3:** Adapt good pharmacy practice in compounding, selecting, dispensing, storing, analyzing and distributing medicines, including medicinal plant products, in a manner sustaining their quality.
- C4:** Apply good manufacturing practices in synthesis, extraction, isolation, purification, quantitative analysis and standardization of active substances from different origins.





- C5: Judge ethically selecting and dispensing appropriate medicines, cosmetics preparations including herbal products, according to good clinical practice guidelines.**
- C6: Analyze results of various lab tests for selecting the proper strategies for treatment of different diseases and controlling microbial contamination in different settings.**
- C7: Determine the type of poison according to the symptoms.**
- C8: Assemble professional skills for operating instruments & equipment and handling experimental animals & biological specimen.**
- C9: Explain different drug-related problems including health hazards**
- C10: Practice patient counseling during dispensing OTC & prescription products to ensure safe and proper use of medicines and cosmetic preparations.**
- C11: Demonstrate competence in generating, presenting, analyzing and interpreting experimental and mathematical data.**
- C12: Solve problems encountered in pharmaceutical fields in addition to the employment of suitable quality control tests for manufactured products.**
- C13: Analyze management issues and economic principles involved in industrial operations, in addition to the determination of costs, approximate profit second to investment in a given process and a unified tax return.**
- C14: Apply proper pharmaceutical registration rules, documentation and drug filing system.**
- C15: Design systematic search strategy for retrieving, analyzing and evaluating relevant information.**

#### **2.4. General Skills:**

**By completion of the program, students should be able to:**

**D1: Demonstrate capability of communication by verbal and written means.**

**D2: Utilize literature for the evaluation of the information from different sources including the library, internet...etc.**

**D3: Demonstrate effective participation in group-based learning**



**D4: Use numeracy, calculation, and statistical methods, as well as information technology tools.**

**D5: Develop self-learning skills needed for continuous professional development**

**D6: Employ different skills required for sales, marketing and pharmacy administration**

**D7: Use ethical, legal and safety guidelines in evaluating & dealing with different problems and in decision making**

**D8: Show creativity and time management abilities**

**D9: Demonstrate the ability of critical thinking and problem solving**

**D10: Show different writing and presentation skills**

### **3. Academic Standards of Program Specification:**

- The Faculty adopts the Academic Standards of the National Authority for Quality Assurance and Accreditation of Education (NAQAAE) NARS 2009 in a faculty council on 12/3/2012.
- NARS 2009 was previously discussed and adopted in all departments' councils.
- Comparative study between graduate attributes and ILOs of pharmacy program (Bylaw 2006) versus NARS 2009 is available as attached extension.
- In April 2017, NAQAAE accredited a new version for Competency-Based NARS, so the faculty started to take action towards NARS 2017.
- Competency-Based NARS 2017 was discussed and adopted in all departments' councils and finally adopted in a faculty council on 7/10/2019
- Gap Analysis between Pharmacy Program Bylaw 2006 & Competency-Based NARS 2017 was carried out by a committee in Quality Assurance Unit (QAU) composed of staff members from all departments.
- The outcome of this meeting was an action plan which was accredited in a faculty council on 10/2/2020
- The action plan included updating teaching and learning strategy and assessment methods, to be in line with Competency-Based NARS 2017.
- QAU started to organize workshops to train and increase the awareness of staff members about Competency-Based NARS 2017 and the updated teaching and learning strategy and assessment methods.
- As a major procedure done by the committee of programs development was establishing a new bylaw aligned with NARS 2017 and it was approved by the committee of the Pharmaceutical Sector in September 2019.
- All previous documents are available as external extensions.



## ➤ National Academic Reference standards (NARS) 2009

### 1. Attributes of the Graduates

Pharmacy graduates work in a multi-disciplinary profession and must acquire the necessary attributes in various pharmacy aspects for pursuing their career. They should demonstrate comprehensive knowledge, clear understanding and outstanding skills as follows:

- 1.1. Handle chemicals and pharmaceutical products effectively and safely with respect to relevant laws and legislations.
- 1.2. Capable of formulating, preparing pharmaceutical products from different sources and participating in systems for dispensing, storage and distribution of medications.
- 1.3. Perform various qualitative and quantitative analytical techniques and fulfill criteria of GLP and GPMP to assure the quality of raw materials, procedures and pharmaceutical products.
- 1.4. Provide information and education services to community and patients about rational use of medications and medical devices.
- 1.5. Comprehend principles of pathophysiology of diseases and participate with other health care professionals in improving health care services using evidence-based data.
- 1.6. Plan, design and conduct research using appropriate methodologies.
- 1.7. Develop presentation, promotion, marketing, business administration, numeric and computation skills.
- 1.8. Demonstrate capability of communication skills, time management, critical thinking, problem-solving, decision-making and team-working.
- 1.9. Perform responsibilities in compliance with legal, ethical and professional rules.
- 1.10. Able to be a life-long learner for continuous improvement of professional knowledge and skills.

### 2. Knowledge and Understanding

The pharmacy graduate must demonstrate comprehensive knowledge and clear understanding of the core information associated with the profession as follows:

- 2.1. Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.
- 2.2. Physico-chemical properties of various substances used in preparation of medicines including inactive and active ingredients as well as biotechnology and radiolabeled products.
- 2.3. Principles of different analytical techniques using GLP guidelines and validation procedures
- 2.4. Principles of isolation, synthesis, purification, identification, and standardization methods of pharmaceutical compounds.
- 2.5. Principles of drug design, development and synthesis.
- 2.6. Properties of different pharmaceutical dosage forms including novel drug delivery systems.



- 2.7. Principles of various instruments and techniques including sampling, manufacturing, packaging, labeling, storing and distribution processes in pharmaceutical industry.
- 2.8. Principles of pharmacokinetics and biopharmaceutics with applications in therapeutic drug monitoring, dose modification and bioequivalence studies.
- 2.9. Principles of hospital pharmacy including I.V. admixtures, TPN and drug distribution system.
- 2.10. Principles of public health issues including sources and control of microbial contamination as well as sanitation, disinfection, sterilization methods and microbiological QC of pharmaceutical products.
- 2.11. Principles of body function in health and disease states as well as basis of genomic and different biochemical pathways regarding their correlation with different diseases.
- 2.12. Etiology, epidemiology, laboratory diagnosis and clinical features of different diseases and their pharmacotherapeutic approaches.
- 2.13. Pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, ADRs and drug interactions.
- 2.14. Principles of clinical pharmacology, pharmacovigilance and the rational use of drugs.
- 2.15. Basis of complementary and alternative medicine.
- 2.16. Toxic profile of drugs and other xenobiotics including sources, identification, symptoms, management control and first aid measures.
- 2.17. Methods of biostatistical analysis and pharmaceutical calculations.
- 2.18. Principles of management including financial and human resources.
- 2.19. Principles of drug promotion, sales and marketing, business administration, accounting and pharmacoeconomics.
- 2.20. Principles of proper documentation and drug filing systems.
- 2.21. Regulatory affairs, pharmacy laws and ethics of health care and pharmacy profession.

### **3. Professional and Practical Skills**

- 3.1. Use the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.
- 3.2. Handle and dispose chemicals and pharmaceutical preparations safely.
- 3.3. Compound, dispense, label, store and distribute medicines effectively and safely.
- 3.4. Extract, isolate, synthesize, purify, identify, and/or standardize active substances from different origins.
- 3.5. Select medicines based on understanding of etiology and pathophysiology of diseases.
- 3.6. Monitor and control microbial growth and carry out laboratory tests for identification of infectious and non-infectious diseases.



- 3.7. Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens.
- 3.8. Apply techniques used in operating pharmaceutical equipment and instruments.
- 3.9. Maintain public awareness on rational use of drugs and social health hazards of drug abuse and misuse.
- 3.10. Advise patients and other health care professionals about safe and proper use of medicines.
- 3.11. Conduct research studies and analyze the results.
- 3.12. Employ proper documentation and drug filing systems.

#### **4. Intellectual Skills**

- 4.1. Apply pharmaceutical knowledge in the formulation of safe and effective medicines as well as in dealing with new drug delivery systems.
- 4.2. Comprehend and apply GLP, GPMP, GSP and GCP guidelines in pharmacy practice.
- 4.3. Apply qualitative and quantitative analytical and biological methods for QC and assay of raw materials as well as pharmaceutical preparations.
- 4.4. Recognize and control possible physical and/or chemical incompatibilities that may occur during drug dispensing.
- 4.5. Select the appropriate methods of isolation, synthesis, purification, identification, and standardization of active substances from different origins.
- 4.6. Apply the principles of bio-informatics and computer-aided tools in drug design.
- 4.7. Apply various principles to determine the characteristics of biopharmaceutical products.
- 4.8. Select and assess appropriate methods of infection control to prevent infections and promote public health.
- 4.9. Utilize the pharmacological basis of therapeutics in the proper selection and use of drugs in various disease conditions.
- 4.10. Calculate and adjust dosage and dose regimen of medications.
- 4.11. Assess drug interactions, ADRs and pharmacovigilance.
- 4.12. Apply the principles of pharmacoeconomics in promoting cost/effective pharmacotherapy.
- 4.13. Analyze and interpret experimental results as well as published literature.
- 4.14. Analyze and evaluate evidence-based information needed in pharmacy practice.



### **5. General and Transferable Skills**

- 5.1. Communicate clearly by verbal and written means.
- 5.2. Retrieve and evaluate information from different sources to improve professional competencies.
- 5.3. Work effectively in a team.
- 5.4. Use numeracy, calculation and statistical methods as well as information technology tools.
- 5.5. Practice independent learning needed for continuous professional development.
- 5.6. Adopt ethical, legal and safety guidelines.
- 5.7. Develop financial, sales and market management skills.
- 5.8. Demonstrate creativity and time management abilities.
- 5.9. Implement writing and presentation skills.
- 5.10. Demonstrate critical thinking, problem-solving and decision-making abilities.

### **4. External References for Standards (Benchmarks):**

NA



## 5. Program Structure and Contents:

### ➤ Program: Five years

No. of credit hours: Compulsory  Elective  Summer training

Sciences	NARS ILO'S	Faculty Curriculum ILO'S
Basic	10-15 %	18.2%
Pharmaceutical	35-40 %	38.9%
Medical	20-25 %	26.1%
Pharmacy Practice	10-15 %	13.4%
Health and Environmental	5-10 %	5.9%
Behavioral and social	2-4 %	4.9%
Pharmacy Management	2-4 %	2.95%
Discretionary	Up to 8 %	3.9%

### Practical/Summer Training:

350 hr (equivalent to 12 Cr..) in a Pharmaceutical institution

### ➤ Program Course Levels (in credit-hours system):

- Semester 1/ First year: required to pass 17 units distributed as follows: -  
Compulsory: 17 Cr. Elective: 0
- Semester 2/ First year: required to pass 18 units distributed as follows:-  
Compulsory: 18 Cr. Elective: 0
- Semester 3/ Second year: required to pass 20 units distributed as follows:-  
Compulsory: 18 Cr. Elective: 2 Cr.
- Semester 4/ Second year: required to pass 18 units distributed as follows:-  
Compulsory: 18 Cr. Elective: 0
- Semester 5/ Third year: required to pass 17 units distributed as follows:-  
Compulsory: 13 Cr. Elective: 4 Cr.
- Semester 6/ Third year: required to pass 18 units distributed as follows:-  
Compulsory: 16 Cr. Elective: 2 Cr.
- Semester 7/ Fourth year: required to pass 20 units distributed as follows:-  
Compulsory: 18 Cr. Elective: 2 Cr.
- Semester 8/ Fourth year: required to pass 18 units distributed as follows:-  
Compulsory: 16 Cr. Elective: 2 Cr.
- Semester 9/ Fifth year: required to pass 19 units distributed as follows:-  
Compulsory: 15 Cr. Elective: 4 Cr.
- Semester 10/ Fifth year: required to pass 18 units distributed as follows:-  
Compulsory: 14 Cr. Elective: 4 Cr.



➤ **Program Curriculum:**

**I. Compulsory Courses:**

<b>First Level</b>					
<b>Semester 1 (Fall)</b>					
Course Code	Course Title	Cr.	Contact Hours per Week		
			Lect.	Tut.	Lab.
ENG 101	English Language 1	2	1	0	2
PHR 177	Biophysics	3	2	1	2
PHR 121	Physical Chemistry	2	2	1	0
PHR 122	General Chemistry	3	2	0	2
PHR 171	Cell and Molecular Biology	3	2	0	2
MAT 105	Mathematics	2	2	2	0
PHR 101	Orientation to pharmacy	1	1	1	0
PHR 102	Pharmaceutical Terminology	1	1	0	0
<b>Total semester credit hours</b>		<b>17</b>			
<b>Semester 2 (Spring)</b>					
ENG102	English Language 2	2	1	0	2
PHR 125	Basic Inorganic Chemistry	3	2	1	2
PHR 131	Basic Organic Chemistry	3	2	0	2
PHR 141	Botany and Medicinal Plants	3	2	0	2
PHR 178	Anatomy and Histology	3	2	1	2
COM 101	Computer Fundamentals	2	1	1	2
PHR 110	Ethics and History of Pharm. Practice	2	2	0	0
<b>Total semester credit hours</b>		<b>18</b>			





<b>Second level</b>					
<b>Semester 3 (Fall)</b>					
PHR 242	Pharmacognosy 1	3	2	1	2
PHR 211	Physical Pharmacy	3	2	0	2
PHR 272	Physiology 1	2	2	1	0
PHR 223	Analytical Chemistry 1	3	2	1	2
PHR 232	Organic Chemistry 1	4	3	0	2
PHR 251	Microbiology 1	3	2	0	2
	Elective	2			
<b>Total semester credit hours</b>		<b>20</b>			
<b>Semester 4 (Spring)</b>					
MAT 208	Basic Statistics	1	1	1	0
PHR 212	Drug Dosage Forms 1	2	1	1	2
PHR 273	Physiology 2	2	2	1	0
PHR 224	Analytical Chemistry 2	3	2	1	2
PHR 233	Organic Chemistry 2	4	3	1	2
PHR 243	Pharmacognosy 2	3	2	1	2
PHR 252	Microbiology 2	3	2	0	2
<b>Total semester credit hours</b>		<b>18</b>			

<b>Third Level</b>					
<b>Semester 5 (Fall)</b>					
PHR 374	Biochemistry 1	3	2	0	2
PHR 312	Drug Dosage Forms 2	2	1	1	2
PHR 326	Pharmaceutical Analysis	3	2	1	2
GEN 103	Pharmaceutical Management	2	2	0	0
PHR 343	Phytochemistry	3	2	1	2
	Elective	4			
<b>Total semester credit hours</b>		<b>17</b>			
<b>Semester 6 (Spring)</b>					
PHR 375	Biochemistry2	3	2	1	2
PHR 344	Evaluation of Crude drugs	3	2	0	2
PHR 314	Biopharmaceutics	3	2	1	2
PHR 380	Pharmacology1	3	2	0	2
PHR 327	Medicinal Chemistry 1	4	3	1	2
	Elective	2			
<b>Total semester credit hours</b>		<b>18</b>			



<b>Fourth Level</b>					
<b>Semester 7 (Fall)</b>					
PHR 428	Medicinal Chemistry 2	4	3	1	2
PHR 461	Pharmacogen.&Pharmacoinmunology	2	2	1	0
PHR 403	Library and Drug Information	2	2	1	0
PHR 481	Pharmacology 2	3	2	0	2
PHR 415	Hospital Pharmacy	2	2	1	0
PHR 416	Principles & Kinetics of drug Stab.	3	2	0	2
PHR 413	Sterile Preparations	2	1	0	2
	Elective	2			
	<b>Total semester credit hours</b>	<b>20</b>			
<b>Semester 8 (Spring)</b>					
PHR 404	Pharmaceutical Technology	3	2	0	2
PHR 446	Forensic Pharmacognosy	3	2	0	2
PHR 417	Pharmacokinetics	2	2	1	0
PHR 418	Community Pharmacy	3	2	0	2
PHR 476	Forensic Chemistry	3	2	0	2
PHR 453	Pathogen. & Etiology of Infect. Dis.	2	2	1	0
	Elective	2			
	<b>Total semester credit hours</b>	<b>18</b>			
<b>Fifth Level</b>					
<b>Semester 9 (Fall)</b>					
PHR 525	Analytical Quality Control	3	2	1	2
PHR 505	Industrial Quality Control and GMP	3	2	1	2
PHR 582	Bioevaluation and Drug Screening	3	2	0	2
PHR 511	Clinical Pharmacy	3	2	1	2
PHR 513	Cosmetics	2	2	1	0
PHR 570	First Aid	1	1	1	0
	Elective	4			
	<b>Total semester credit hours</b>	<b>19</b>			
<b>Semester 10 (Spring)</b>					
PHR 554	Drug Biotechnology	2	2	1	0
PHR 555	Applied Industrial Hygiene	2	2	1	0
PHR 506	Pharmaceutical Manufac. Processes	2	2	1	0
PHR 508	Unit Operation	2	2	1	0
PHR 583	Pharmacotherapeutics	2	2	1	0
PHR 556	Pharmacoepidemiology	2	2	1	0
PHR 600	Seminar Or Project	2	2	0	0
	Elective	4			
	<b>Total semester credit hours</b>	<b>18</b>			



## II. Elective Courses:

### A. Elective General Courses:

In addition to the required general courses, student should select 3 courses (6 Cr.) of the following:

No.	Course title	Course code	Cr.	Pre-requisite
1	Legislation and Health Policies	GEN104	2	-
2	Professional Communication	GEN 105	2	-
3	Taxes	GEN 106	2	-
4	Political Sciences	GEN 107	2	-
5	Environment and Society	GEN 108	2	-
6	Cultural Studies	GEN 109	2	-
7	Principles of Sales and Marketing	GEN 110	2	-
8	Sophomore Rhetoric	ENG 500	2	ENG 102
	<b>Required</b>		<b>6 Cr.</b>	



In addition to the compulsory courses, student should select 7 elective courses (14 Cr.) among the following:

**B. Elective Pharmaceutical Sciences Courses:**

No.	Course title	Course code	Cr.	Pre-requisite
1	Applied Statistics	MAT 505	2	MAT 208
2	Design and Formulation of Drug Dosage Forms	PHR 507	2	PHR 417
3	Advanced Pharmaceutics	PHR 512	2	PHR 312,413
4	Advanced Drug Delivery System	PHR 514	2	PHR 511
5	Home Health Care	PHR 515	2	PHR 511
6	Advanced Instrumental Analysis	PHR 520	2	PHR 326
7	Advanced Pharmaceutical Chemistry	PHR 529	2	PHR 428
8	Applied Pharmacognosy	PHR 546	2	PHR 242,326,343
9	Advanced Microbiology	PHR 558	2	PHR 252
10	Mycology	PHR 562	2	PHR 252
11	Virology	PHR 563	2	PHR 252
12	Parasitology	PHR 564	2	PHR 171
13	Immunopharmaceutics	PHR 565	2	PHR 461
14	Hematology	PHR 571	2	PHR 380,481
15	Radiation Pharmacy	PHR 572	2	PHR 121,171
16	Fundamentals of Clinical Chemistry	PHR 573	2	PHR 375
17	Nutrition	PHR 574	2	PHR 380,481
18	Molecular Therapeutics	PHR 585	2	PHR 380,481
19	Geriatric Pharmacy	PHR 586	2	PHR 380,481
20	Pediatric Drug Therapy	PHR 587	2	PHR 380,481
21	Complementary/Alternative Therapeutics	PHR 589	2	PHR 380,481
<b>Required</b>			<b>14 Cr.</b>	



## 6. Program Courses Contents:

### Courses Offered or Supervised by the Department of Drug Industries

#### I. Required Courses:

**Course Code or Number: PHR 101**

**Course Title: Orientation to Pharmacy**

**Contents:** The course involves a survey of professional pharmacy, dealing with the mission of pharmacy and role of pharmacist in society, educational requirements, pharmaceutical calculations encountered with practice of pharmacy organization, main routes of drug administration and dosage forms. Fundamentals are also discussed. Students self-learning and effective team skills are developed through presentation and group discussion on the main topics of the course.

**Course Code or Number: PHR 102**

**Course Title: Pharmaceutical Terminology**

**Contents:** The course will introduce students to different definition of pharmacy terms including prescription terminology. It also includes medical terms used in diagnoses and drug description.

**Course Code or Number: GEN 103**

**Course Title: Pharmaceutical Management**

**Contents:** Management in a variety of health care settings, including hospitals and integrated systems, managed care organizations and in pharmacy services. Decision making and planning, team work and communication process.

**Course Code or Number: PHR 403**

**Course Title: Library and Drug Information**

**Contents:** Spectrum, types, handling of questions, information resources, literature evaluation, establishment of DIPC, sources, computerized drug information retrieval systems, internet, references, medical letters, study designs and clinical trials, professional literature.

**Course Code or Number: PHR 404**

**Course Title: Pharmaceutical Technology**

**Contents:** Micromeritics, preformulation, formulation manufacturing of tablets, capsules, suppositories, micro encapsulation, liposome and also sustained release dosage forms. *Pre-requisite: PHR 212, 312, 413.*

**Course Code or Number: PHR 505****Course Title: Industrial Quality Control and Good Manufacturing Practice (GMP)**

**Contents:** Organization structure and personal qualifications; investigation; receiving materials; sampling; material handling and uses; buildings and facilities; equipment; validation; documentation; computer validation; quality assurance.

*Pre-requisite: PHR 404.*

**Course Code or Number: PHR 506****Course Title: Pharmaceutical Manufacture Processes**

**Contents:** Problems encountered during manufacture of various pharmaceutical dosage forms and their treatments. Modern challenges in pharmaceutical industry in different areas, design and scaling up problems.

*Pre-requisite: PHR 404*

**Course Code or Number: PHR 508****Course Title: Unit Operation**

**Contents:** Heat transfer, evaporation, drying, crystallization, filtration, centrifugation, distillation, refrigeration, mixing, size reduction & etc...

*Pre-requisite: PHR 404*

**II. Elective Courses:****Course Code or Number: GEN104****Course Title: Legislation and Health Policies**

**Contents:** Introductory pharmacy laws, background and ethical principles in pharmacy practice. Essential drug list, Rational drug use, Therapeutic guidelines, National drug policy. Introduction to drug/product registration. Ethical issues in product promotion

**Course Code or Number: GEN 105****Course Title: Professional Communication**

**Contents:** Provides practice experience through active learning exercises and stimulated interactions with patients and health care providers. Emphasis on the use of correct and effective language and organization skills in preparing, delivering and evaluating different types of oral presentation. Analysis of sample live or videotaped speeches

**Course Code or Number: GEN 106****Course Title: Taxes**

**Contents:** Explanation of the concept of taxes, their importance, and their several types in the local regime, such as sales, income taxes. The course refers to the laws that govern the relationship between the suppliers tax-payers and the tax authority.



**Course Code or Number: GEN 110**

**Course Title: Principles of Sales and Marketing**

**Contents:** Understanding the environment of marketing in pharmacy, strategic planning for markets winning, analyzing marketing opportunities, analyzing customer behavior and customer satisfaction, developing new products, product life cycle and managing life-cycle strategies.

**Course Code or Number: PHR 507**

**Course Title: Design and Formulation of Drug Dosage Forms**

**Contents:** Principle of design and formulation problems encountered with different types of dosage forms, principles of controlled drug release from polymer system. *Pre-requisite: PHR 417.*

### **Courses Offered or Supervised by the Department of Pharmaceutics**

#### **I. Required Courses:**

**Course Code or Number: PHR 110**

**Course Title: Ethics and History of Pharmacy practice**

**Contents:** This course will provide students with a study of the development of the profession of pharmacy, emphasizing the historical background and ethical principles upon which the profession rests. The nature and place of pharmaceutical services in society as well as the moral standards and professional conduct required for pharmacists are emphasized.

**Course Code or Number: PHR 211**

**Course Title: Physical Pharmacy**

**Contents:** *The course is concerned with the fundamental principles of interfacial phenomena, Rheology, colloids, suspensions and emulsions.*  
*Pre-requisite: PHR 121.*

**Course Code or Number: PHR 212**

**Course Title: Drug Dosage Forms (I)**

**Contents:** The course deals with the principles and techniques involved in the design, formulation and quality control testing of liquid dosage forms (syrups, mixtures, elixirs, tinctures, lotions and others) and semisolid dosage forms (ointments, creams, gels and pastes). *Pre-requisite: PHR 211.*

**Course Code or Number: PHR 312**

**Course Title: Drug Dosage Forms (II)**

**Contents:** The course deals with principles of formulation, preparation, quality control and manufacturing problems of solid dosage forms (tablets, capsules and suppositories).  
*Pre-requisite: PHR 211.*

**Course Code or Number: PHR 314****Course Title: Biopharmaceutics**

**Contents:** Physicochemical properties of drugs and biological factors affecting therapeutic response. Mathematical characterization of the processes of absorption, distribution and metabolism. Drug interactions and drug delivery system. Bioequivalence testing, methodology, guidelines, assay validation methods, and statistical analysis of bioequivalence data. Theory to dosage regimen adjustment and products selection. *Pre-requisite: PHR 312.*

**Course Code or Number: PHR 415****Course Title: Hospital Pharmacy**

**Contents:** This course is designed to introduce the student to the physical examination process. This process is a valuable tool in monitoring the efficacy of patients' medical therapies. Presentations detailing the physical examination associated with selected organ systems are followed by laboratory sessions whereby students practice learned techniques. Students also experience exposure to unit-dose monitoring, and pharmacy management. Drug weight / volume concentrations, dilution & additive volumes are calculated in compounding of parenteral products in various patient-care setting using aseptic techniques. *Pre-requisite: GEN 103.*

**Course Code or Number: PHR 416****Course Title: Principles and Kinetics of Drug Stability**

**Contents:** Routes of drug degradation, principles and kinetics of chemical degradation, stress stability testing. Means of prolonging shelf life of pharmaceutical products. *Pre-requisite: PHR 212, 312.*

**Course Code or Number: PHR 413****Course Title: Sterile Pharmaceutical Preparations**

**Contents:** The course includes formulation and quality control testing of parenteral and ophthalmic preparations. Sterile pharmaceutical products that may be prepared and/or dispensed by a hospital pharmacy department will also be discussed. Principles of sterile products manipulation for the purpose of intravenous admixture of drug doses and products are emphasized. *Pre-requisite: PHR 212.*

**Course Code or Number: PHR 417****Course Title: Pharmacokinetics**

**Contents:** Basic pharmacokinetics, drug kinetics in renal impairment, hepatic dysfunction and cardiac diseases. Drug dose monitoring and application to selected drugs. Digoxin and phenytoin are examples. *Pre-requisite: PHR 314, PHR 416.*



**Course Code or Number: PHR 418****Course Title: Community Pharmacy**

**Contents:** Pharmaceutical care principles applied to the community pharmacy environment. Participation in the development, implementation and outcome evaluation of patient care services. Special emphases on psychiatric pharmacy practice, women's health, pediatric drug therapy, pain management, geriatric pharmacy. *Pre-requisite: PHR 212, PHR 312.*

**Course Code or Number: PHR 511****Course Title: Clinical Pharmacy**

**Contents:** Pharmaceutical care, application, interpretation of clinical data, information resources, side effects, drug-induced diseases, drug interactions. Clinical PCK and application with amino glycosides, digoxin, theophylline. *Pre-requisite: PHR 417.*

**Course Code or Number: PHR 513****Course Title: Cosmetics**

**Contents:** The course is designed to provide modern knowledge of the skin care products (sunscreen, suntan, antiacne, skin depigmenting products, emollients, moisturizers, antiperspirants, facial masks and others) and the hair care products (hair dyes, shampoos, conditioners, hair straightening products and others). Skin care in relation to skin anatomy, physiology and functions are discussed. *Pre-requisite: PHR 212.*

**II. Elective Courses:****Course Code or Number: PHR 512****Course Title: Advanced Pharmaceutics**

**Contents:** Drug targeting, novel drug delivery system, pharmaceutical biotechnology, radio pharmaceuticals. *Pre-requisite: PHR 312, 413.*

**Course Code or Number: PHR 514****Course Title: Advanced Drug Delivery System**

**Contents:** Design and application of polymers, liposomes, micro / nano particles, prodrugs, and macromolecules for parenteral, oral, transdermal, respiratory and CNS drug delivery. *Pre-requisite: PHR 511*

**Course Code or Number: PHR 515****Course Title: Home Health Care**

**Contents:** Practical experience in the provision of comprehensive home intravenous and nutritional support services, including fluid and electrolyte therapy, chemotherapy, antibiotics, pain control and nutrition support. *Pre-requisite: PHR 511*



### Courses Offered or Supervised by the Department of Analytical & Pharmaceutical Chemistry

#### I. Required Courses:

**Course Code or Number: PHR 121**

**Course Title: Physical Chemistry**

**Contents:** States of matter and definition of states. Gases, properties and kinetic molecular theory of gases. Thermo chemistry and thermodynamics; first, second and third law, thermodynamic parameters and relations. Liquids; phase transition, vapor pressure and the Clausius Clapeyron equation, phase diagram, introduction to the phase rule for one and two-component system, eutectic mixture, properties of liquids and intermolecular forces. Solids; types and properties of solids, crystal lattice and unit cell, calculations involving unit cell dimension, introduction to X-ray diffraction. Solutions, type and properties, solubility, effect of temperature and pressure, Henry's law, conversion of concentration units, colligative properties for non-electrolyte solutions and Raoult's law, electrical conductivity of solution, colligative properties for electrolyte solutions, activity and activity coefficients. Colloids

**Course Code or Number: PHR 122**

**Course Title: General Chemistry**

**Contents:** A study of physical measurements in chemistry, atomic structure, the periodic table and bonding, chemical calculations and stoichiometry, chemical reactions and chemical equilibrium.

**Course Code or Number: PHR 125**

**Course Title: Basic Inorganic Chemistry**

**Contents:** Overview of the theoretical basis of qualitative analysis. Systematic analysis of anions. Systematic analysis of cations of group I (Ag group) through group V (alkali group). Systematic analysis of cations mixtures. Mixtures of pharmaceutical interest including difficulties.

*Pre-requisite: PHR 122.*

**Course Code or Number: PHR 131**

**Course Title: Basic Organic Chemistry**

**Contents:** Introduction to the basic concepts of organic chemistry with an emphasis on the relation between structure and properties, chemistry of aliphatic hydrocarbons and stereochemistry. Alkenes and conjugated dienes, alkylhalides, aliphatic alcohols, ethers and epoxides.

**Course Code or Number: MAT 105**

**Course Title: Mathematics**

**Contents:** Functions and graphing. Limits, derivatives of 1<sup>st</sup> and higher order, differentiation. Inverse functions, integration and application to finding area, volume and average values.

**Course Code or Number: COM 101****Course Title: Computer fundamentals**

**Contents:** This course will enable students to use computers for professional, educational and business problem-solving. It will also introduce students to computer terminology, on-line information resources, hardware peripherals, CD-ROM databases, programs and multimedia computing systems that pharmacists can use in their practice.

**Course Code or Number: PHR 223****Course Title: Analytical Chemistry (I)**

**Contents:** Fundamentals of qualitative and quantitative chemical analysis, concentrations and stoichiometric calculations. Errors and uncertainties in quantitative analysis. Volumetric analysis; acid-base titration in aqueous and non-aqueous media, precipitation titration and solubility of precipitates in water, overview of complex formation equilibrium and complexometric titration, Gravimetry, homogenous precipitation & contamination. Errors and data analysis.

*Pre-requisite: PHR 121, 125.*

**Course Code or Number: PHR 224****Course Title: Analytical Chemistry (II)**

**Contents:** Electron transfer reactions, Nernst equation, standard electrode potential, application of redox titrations. Electroanalytical techniques; potentiometry, conductometry & voltammetry. Application in water analysis, cations, anions and dissolved gases. Lipid analysis, physical and chemical examination of adulterants.

*Pre-requisite: PHR 223.*

**Course Code or Number: PHR 232****Course Title: Organic Chemistry (I)**

**Contents:** A comprehensive study of substitution and elimination reactions and a study of the chemistry of the aromatic compounds, alcohols, ethers, carboxylic acids. Phenols and quinones, aromatic sulphonic acids and their derivatives.

*Pre-requisite: PHR 131.*

**Course Code or Number: PHR 233****Course Title: Organic Chemistry (II)**

**Contents:** Nitrogenous compounds, arylhalides, alicyclic compounds, carbohydrates, polynuclear compounds, hetero-cyclic compounds, spectroscopy applications. *Pre-requisite: PHR 232.*

**Course Code or Number: PHR 326****Course Title: Pharmaceutical Analysis**

**Contents:** Absorption and emission spectroscopy; molecular ultraviolet and visible spectroscopy, infrared spectroscopy, introduction to flow injection analysis (FIA). Atomic spectroscopy; atomic absorption spectroscopy, flame emission spectroscopy, atomic fluorescence spectroscopy. Refractometry and polarimetry. Selection of qualitative and quantitative applications in drug analysis and pharmaceutical products.

*Pre-requisite: PHR 224.*

**Course Code or Number: PHR 327****Course Title: Medicinal Chemistry (I)**

**Contents:** Fundamentals of medicinal chemistry and an introduction to the physico-chemical properties of drugs relative to their biological effects. Chemical and biochemical aspects of certain drug categories including: anti-infective agents, antineoplastics, antiviral drugs and diagnostic agents, antihistamines.

*Pre-requisite: PHR 233, 326.*

**Course Code or Number: PHR 428****Course Title: Medicinal Chemistry (II)**

**Contents:** Chemical and biological aspects of certain drugs including: steroids, cardiovascular drugs, gastrointestinal drugs, respiratory drugs, diuretics, hypoglycemics, prostaglandins and vitamins, drugs acting on autonomic and central nervous system, analgesics. *Pre-requisite: PHR 327*

**Course Code or Number: PHR 525****Course Title: Analytical Quality Control**

**Contents:** Analytical quality control of drugs; sample preparation and sample analysis in different matrices, drug mixtures, products of DNA technology. The use of automated instrumental analysis in drugs and pharmaceutical products control covering QA and QC laboratory procedures; SOP, detection limits and LOQ. Microbiological quality control of pharmaceutical products. *Pre-requisite: PHR 428.*

**II. Elective Courses:****Course Code or Number: PHR 520****Course Title: Advanced Instrumental Analysis**

**Contents:** Atomic emission spectroscopy with plasma and electrical discharge, ICP atomic fluorescence spectroscopy. Mass spectra and related techniques of GC-MS. Thermal analysis. X-ray spectroscopy, X-ray fluorescence method – qualitative and quantitative analysis. Automated methods of analysis with flow injection methods in separation, electro migration and spectroscopic techniques.

*Pre-requisite: PHR 326.*



**Course Code or Number: PHR 529**

**Course Title: Advanced Pharmaceutical Chemistry**

**Contents:** Advanced study of the various classes of medicinal compounds, with particular emphasis on biological activity, mechanism of action, biotransformation, and the structural and physical properties governing absorption, distribution, and excretion. *Pre-requisite: PHR 428.*

**Courses Offered or Supervised by the Department of  
Pharmacognosy & Medicinal Plants**

**I. Required Courses:**

**Course Code or Number: PHR 141**

**Course Title: Botany and Medicinal Plants**

**Contents:** Taxonomy of important families and their macroscopic and microscopic characteristics. Plant cells differentiation and cell contents (primary and secondary metabolites, chemical tests). Macroscopical and microscopically characteristics of different organs (leaves, flowers, seeds, fruits, stems, subterranean organs: roots and rhizomes).

**Course Code or Number: ENG 101**

**Course Title: English (I)**

**Contents:** A course is designed to establish effective reading, writing, oral/aural, and study skills. Emphasis on essay writing. Academic style and task-based work are stressed.

**Course Code or Number: ENG 102**

**Course Title: English (II)**

**Contents:** A required course designed to establish advanced reading and writing skills. Emphasis on essay writing as well as research techniques. The major project is an expository research paper. Academic styles are emphasized.

*Pre-requisite: ENG 101.*

**Course Code or Number: PHR 242**

**Course Title: Pharmacognosy (I)**

**Contents:** Study of the important medicinal drugs from leaves, herbs, barks & wood. It also includes active constituents, medicinal uses and chemical tests. *Pre-requisite: PHR 141.*

**Course Code or Number: PHR 243****Course Title: Pharmacognosy (II)**

**Contents:** This is a continuation of PHR 242. It includes diagnostic macro & microscopical characteristics of flowers, seeds, fruits, and subterranean organs. It also includes unorganized drugs.

*Pre-requisite: PHR 242.*

**Course Code or Number: PHR 343****Course Title: Phytochemistry****Contents:**

Different classes of bioactive constituents of crude drugs, emphasizing the definition, classification, preparation, molecular structures, physical and chemical characteristics, action, SAR, methods of quantitation. Carbohydrates, glycosides, essential oils, bitter principles, alkaloids, miscellaneous natural products. *Pre-requisite: PHR 224, 233, 243.*

**Course Code or Number: PHR 344****Course Title: Evaluation of Crude Drug**

**Contents:** Concept and methods of crude drug evaluation, microscopical, physico-chemical, chromatographic and spectroscopic methods, General biosynthetic pathways of secondary metabolites. Methods of production of drugs from medicinal plant products. *Pre-requisite: PHR 224, 233, 243*

**Course Code or Number: PHR 446****Course Title: Forensic Pharmacognosy**

**Contents:** Plants and natural products that constitute potential health hazards. Drug dependence, narcotics, analgesics, psychoenergetics and hallucinogens of plant origin. Mycotoxin as a serious threat to general health and safety of community.

*Pre-requisite: PHR 243, 428.*

**II. Elective Courses:****Course Code or Number: GEN 107****Course Title: Political Sciences**

**Contents:** Politics as social sciences, basic concept in political science power, authority, leadership, decision making. Relevant political ideologies, contemporary political system, their modes and functions.

**Course Code or Number: GEN 109****Course Title: Cultural Studies**

**Contents:** A general humanities course covering ancient Near East, Greece, Judaism, Christianity, Islam and Medieval Europe.

Some aspects of 19<sup>th</sup> century thoughts including Marx, Darwin and Islamic Response.

**Course Code or Number: ENG 500****Course Title: Sophomore Rhetoric**

**Contents:** Required for practice in reading, evaluating, formulating and presenting opinions in writing based on the best available evidence using the methods of formal argument. Both academic and literary styles are emphasized. The major project is a persuasive and/or critical research paper.

*Pre-requisite: ENG 102.*

**Course Code or Number: PHR 546****Course Title: Applied Pharmacognosy**

**Contents:** Identification of natural products using physicochemical methods. production of medicinal plants, evaluation of crude medicinal plants. Use of recent chromatographic methods for quality control of crude drugs production

*Pre-requisite: PHR 242, 343, 326.*

**Courses Offered or Supervised by the Department of  
Microbiology & Immunology**

**I. Required Courses:****Course Code or Number: PHR 251****Course Title: Microbiology (I)**

**Contents:** Introduction, classification of viruses, bacteria and fungi related to human diseases. Etiology, pathogenesis and management of common microbial infections. *Pre-requisite: PHR 171.*

**Course Code or Number: PHR 252****Course Title: Microbiology (II)**

**Contents:** Chemotherapeutic agents and mechanisms of microbial resistance, disinfectants, preservatives, and antiseptics; industrial microbiology; hazards of microbial contamination of pharmaceuticals. *Pre-requisite: PHR 251.*

**Course Code or Number: PHR 461****Course Title: Pharmacogenetics and Pharmacoimmunology**

**Contents:** Basics of molecular genetics dealing with principles governing the hereditary variation, cloning and other DNA technology applications. Fundamentals of immunology, monoclonal antibodies technology and vaccine products, antimicrobial identification. *Pre-requisite: PHR 252.*

**Course Code or Number: PHR 453****Course Title: Pathogenesis and Etiology of Infectious Diseases**

**Contents:** Introduction to general pathology, inflammation, cell injury, circulatory disturbance, infectious diseases and neoplasia with special emphasis on cancer etiology.

*Pre-requisite: PHR 252.*



**Course Code or Number: PHR 554**

**Course Title: Drug Biotechnology**

**Contents:** An overview of biotechnology in health care, recombinant DNA technology and regulatory issues; monoclonal antibody technology and manufacturing diagnostic products, therapeutic agents, vaccines, gene therapy. Future of biotechnology in antimicrobial identification. *Pre-requisite: PHR 461.*

**Course Code or Number: PHR 555**

**Course Title: Applied Industrial Hygiene**

**Contents:** Methods of sterilization (heat, UV, ionizing radiation filtration, gaseous). Sterility testing, environmental control, good manufacture practice regulations. Quality assurance organization. Total quality control and documentation. *Pre-requisite: PHR 252.*

**Course Code or Number: PHR 556**

**Course Title: Pharmacoepidemiology**

**Contents:** Health policy, pharmaceutical care concept, drug utilization study, management and regulations, post-marketing surveillance, case analysis and presentation.

*Pre-requisite: PHR 252.*

**II. Elective Courses:**

**Course Code or Number: GEN 108**

**Course Title: Environment and Society**

**Contents:** Explanation of environment and its interaction with human beings' life. Environment Hazards, problems and management.

**Course Code or Number: PHR 558**

**Course Title: Advanced Microbiology**

**Contents:** Pharmaceuticals produced by microorganisms, microbial control of pests and plant diseases, products of therapeutic useful substances by recombinant DNA technology. *Pre-requisite: PHR 252.*

**Course Code or Number: PHR 562**

**Course Title: Mycology**

**Contents:** Classification of fungi and mycoses. Keratomycoses, dermatomycoses, candidiasis and deep (systemic) mycoses. Antifungal against common dermatophytes yeasts and various other fungi. Fungi with antibacterial activity against Gram positive bacilli and cocci.

*Pre-requisite: PHR 252.*





**Course Code or Number: PHR 563**

**Course Title: Virology**

**Contents:** Introduction to viral diseases, laboratory diagnosis, DNA viruses, RNA viruses, retroviruses, hepatitis viruses, oncogenic viruses and role of viruses in diseases, prions. *Pre-requisite: PHR 252.*

**Course Code or Number: PHR 564**

**Course Title: Parasitology**

**Contents:** An introduction to parasitology structure and biology and life cycles of different phyla: Protozoa, coelentera, platyhelminths, achelmyntes, Arthropod.

*Pre-requisite: PHR 171.*

**Course Code or Number: PHR 565**

**Course Title: Immunopharmaceutics**

**Contents:** Lectures and discussion session on pharmaceutics-related immunology, including drugs affecting the immune system, antibodies and cytokines as drugs and new development in immunobiotechnology. Emphasizes pre and post transplantation therapy designed to minimize organ rejection, prevent infection and improve survival. *Pre-requisite: PHR 461*

**Courses Offered or Supervised by the Department of  
Pharmacology & Toxicology**

**I. Required Courses:**

**Course Code or Number: PHR 171**

**Course Title: Cell and Molecular Biology**

**Contents:** The course involves the following topics: Cellular organization, cellular metabolism, membrane structure and dynamics, membrane pumps, carriers and channels, reception and transduction of environmental information, cell cycle, cancer, DNA biology and technology, genetic counseling and defense against disease.

**Course Code or Number: PHR 177**

**Course Title: Biophysics**

**Contents:** Heat and laws governing it, geometrical optics, physical optics, and types of dispersing system. Electricity, electric & magnetic flux. Modern physics. X-ray, laser, wave duality. Properties of matter.

**Course Code or Number: PHR 178****Course Title: Anatomy and Histology**

**Contents:** General anatomy and embryology, skeleton and joints, cardiovascular system, respiratory system, digestive system, urogenital system, CNS and proper endocrine system.

The cell, the epithelium, the connective tissue, blood, cartilage, muscular tissue, nervous tissue, the cardiovascular system, lymphatic system and the digestive tract. *Pre-requisite: PHR 171.*

**Course Code or Number: PHR 272****Course Title: Physiology (I)**

**Contents:** Introduction to physiology. Blood constituents, Autonomic nervous system, Excitable tissues (nerve and muscle). Renal system, Acid-base balance, Electrolyte and Water balance. Central nervous system.

*Pre-requisite: PHR 178.*

**Course Code or Number: MAT 208****Course Title: Basic Statistics**

**Contents:** Introduction, data collection, graphical and mathematical presentation of data. Emphasis on statistical concepts and their application to critical appraisal of clinical and experimental data. Interpretation of results.

**Course Code or Number: PHR 273****Course Title: Physiology (II)**

**Contents:** Cardiovascular system, gastrointestinal system, endocrine system, Repro-ductive system and Respiratory system. *Pre-requisite: PHR 272.*

**Course Code or Number: PHR 374****Course Title: Biochemistry (I)**

**Contents:** This course deals with the structure and function of the major biomolecules: carbohydrates, lipids, proteins and nucleic acids. It also covers the catalytic function of enzymes, enzyme kinetics, specificity and allosteric regulation, vitamins and coenzymes. *Pre-requisite: PHR 171, 122, 233.*

**Course Code or Number: PHR 375****Course Title: Biochemistry (II)**

**Contents:** This course covers metabolic processes involving carbohydrates, lipids, proteins, porphyrins. It also deals with some metabolic disorders e.g. diabetes mellitus, PKU, jaundice, etc. It also focuses on enzymes of clinical importance, medical biotechnology and gene therapy. *Pre-requisite: PHR 374.*

**Course Code or Number: PHR 380****Course Title: Pharmacology (I)**

**Contents:** General Principles, drugs acting at the synaptic and neuroeffector trans-mission, autacoids including histamine, kinins, ecosanoids, angiogenesis, serotonin, peptides and others, local anesthetics, drugs acting on the blood and blood forming agents. *Pre-requisite: PHR 273.*

**Course Code or Number: PHR 481****Course Title: Pharmacology (II)**

**Contents:** Drugs affecting renal function, cardiovascular pharmacology, Drugs acting on the central nervous system, NSAIDS, drugs in bronchial asthma, drugs in allergic disorders, drugs affecting gastrointestinal tract, cancer chemotherapy and chemotherapeutic agents. *Pre-requisite: PHR 380.*

**Course Code or Number: PHR 476****Course Title: Forensic Chemistry**

**Contents:** Basic principles of toxicology and biochemical mechanisms of toxicity in mammalian species and man. Correlation between morphological and functional changes caused by toxicants in different organs of the body. Case study of acute poisoning. Teratogenicity and genetic toxicology. Chemical carcinogenesis, environmental and industrial radiations. *Pre-requisite: PHR 428, 481.*

**Course Code or Number: PHR 570****Course Title: First Aid**

**Contents:** Surgical first aid, wounds, hemorrhage shock, burns, fractures, bandaging, acute emergencies, syringes, uses and practical applications, CPR (cardio-pulmonary resuscitation) applications. *Pre-requisite: PHR 481.*

**Course Code or Number: PHR 582****Course Title: Bioevaluation and Drug Screening**

**Contents:** Organization of blind screening, screening of cholinomimetics, anti-muscarinic drugs, adrenomimetics and antagonists, NSAID, skeletal muscle relaxant, CNS drugs, cardiovascular drugs, hormones and their antagonists. *Pre-requisite: PHR 481.*

**Course Code or Number: PHR 583****Course Title: Pharmacotherapeutics**

**Contents:** Pathophysiology and therapeutics of various diseases. Drug selection and dose monitoring, recognition of clinically significant, efficacious and/or toxic drug interaction. Management of different diseases (GIT, cardiovascular, respiratory, CNS, endocrine and malignancy). Case study and problem solving. *Pre-requisite: PHR 481.*



## II. Elective Courses:

**Course Code or Number: MAT 505**

**Course Title: Applied statistics**

**Contents:** Statistical design and analysis techniques needed to perform pharmaceutical research and evaluate clinical data. It includes designing, epidemiologic and clinical studies; evaluating diagnostic testing procedures, interpreting the use of statistical data in pharmacyliterature. Emphasis on statistical concepts and their application to critical appraisal of clinical and experimental data. *Pre-requisite: MAT 208.*

**Course Code or Number: PHR 571**

**Course Title: Hematology**

**Contents:** Structure and function of blood components, blood sampling, techniques used in blood analysis, sedimentation rate, erythrocyte counting, differential count, different indices. *Pre-requisite: PHR 380, 481.*

**Course Code or Number: PHR 572**

**Course Title: Radiation Pharmacy**

**Contents:** A survey of the clinical diagnostic and therapeutic use of radioactive pharmaceuticals. Included are a review of nuclear physics, radiation biology, radiation chemistry, regulatory issues, and foundation safety. These areas are related to the synthesis, formulation, dispensing, and administration of radio-pharmaceuticals.

*Pre-requisite: PHR 121, 171.*

**Course Code or Number: PHR 573**

**Course Title: Fundamentals of Clinical Chemistry**

**Contents:** Sampling, glucose tolerance; plasma protein fractions and significance; kidney function tests, electrolytes, NPN, acid-base balance, liver function tests, endocrine function, gastric and intestinal function.

*Pre-requisite: PHR 375*

**Course Code or Number: PHR 574**

**Course Title: Nutrition**

**Contents:** Biomedical knowledge related to clinical case-management problems to understand the interrelationship between nutrition and health in both hospitalized and healthy persons. Health care policy and financing. Monitoring parameters in chronic diseased persons. *Pre-requisite: PHR 380, 481*

**Course Code or Number: PHR 585****Course Title: Molecular Therapeutics**

**Contents:** Principles of molecular therapeutics against signaling pathways; emphasis on biological mechanisms underlying hormone, growth factor, and neurotransmitters – mediated gene regulation, proliferation and cell death.

*Pre-requisite: PHR 380, 481*

**Course Code or Number: PHR 586****Course Title: Geriatric Pharmacy**

**Contents:** Specialized knowledge and skills in gerontology and geriatric pharmacy including the pathophysiology of selected cardiovascular endocrine, genito- urinary, gastrointestinal disorders, osteoarthritis and osteoporosis. Specialized knowledge and unique functions of health care team providing care to the elderly patient.

*Pre-requisite: PHR 380, 481*

**Course Code or Number: PHR 587****Course Title: Pediatric Drug Therapy**

**Contents:** Clinical therapeutics and pharmacokinetic concepts applied to the pediatric patient. Unique aspects of pediatric clinical pharmacology emphasized in treating a variety of organ system diseases.

*Pre-requisite: PHR 380, 481*

**Course Code or Number: PHR 589****Course Title: Complementary / Alternative Therapeutics**

**Contents:** Examines the therapeutic use of complementary / alternative medicines, such as herbal medicines, homeopathic drugs, vitamins with other nutritional supplements, neural therapy and hydrotherapy.

*Pre-requisite: PHR 380, 481*

**The Degree Project (B.Ph.Sc.):****Course Code or Number: PHR 600****Course Title: Pharmacy Seminar**

**Contents:** This involves case presentation followed by questions and general discussion of the material. The series will provide in-depth exploration of therapeutics of common diseases encountered in clinical practice.

*Pre-requisite: Consent of instructor.*

**Course Code or Number: PHR 600****Course Title: Pharmacy Project**

**Contents:** Introduction to the concept of the project. Both the conceptual and practical issues of the project including question development, selection of the appropriate methods, data sources and analytic approach to address the project question. *Pre-requisite: Consent of instructor.*



## 7. Program Admission Requirements:

Include the following:

- Students must hold the Egyptian high school certificate, Science Section or an equivalent certificate accepted by the Supreme Council of Egyptian Universities.
- Students are nominated for admission to the faculty according to the rules of the Supreme Council of Private Universities.
- Foreign students are nominated for admission to the faculty according to the general regulations of the Ministry of Higher Education.
- Students must fulfill all requirements and comply with the rules of the Faculty.
- Full-time study is required by all students.

## 8. Regulations for Program Course Completion:

In order to complete the requirements for B.Ph.Sc. degree, the student should pass successfully a total of at least 195 credit hours, through a minimum of 5 years study (10 semesters). The total credit hours are distributed for the different courses as follows:

<b>I. Compulsory Courses</b>	163 Cr.
<b>II. Elective Courses</b>	20 Cr.
<b>III. Summer Training</b>	12 Cr. (~350 hrs)

- **Examinations Procedure:**
  - The final grade awarded to student in a course is usually based on the grades for the midterm exam held during the semester in the 8<sup>th</sup> week added to the grade from the final examination at the end of each semester. These grades are distributed as follows:
    - 20% for the mid-semester evaluation.
    - 30% for course work (practical, tutorial, interactive).
    - 50% for the final written exam if there is no oral exam.
    - 40% for the final written exam if there is an oral exam.
    - 10% for oral exam.
  - Each credit hour is allotted a total of 100 points.



- **Grading System:**

Grade		Numerical Average	Grade points
Excellent	A	$X \geq 90$	4.0
Excellent	A-	$85 \leq X < 90$	3.7
Very Good	B+	$80 \leq X < 85$	3.3
Very Good	B	$75 \leq X < 80$	3.0
Good	B-	$70 \leq X < 75$	2.7
Good	C+	$65 \leq X < 70$	2.3
Pass	C	$60 \leq X < 65$	2.0
Pass Conditional	C-	$56 \leq X < 60$	1.7
Pass Conditional	D+	$53 \leq X < 56$	1.3
Pass Conditional	D	$50 \leq X < 53$	1.0
Fail	F	$X < 50$	0.0

**X = Percentage Grade.**

**Grades not included in the GPA:**

(I) incomplete, (W) withdraw, (E) absent with excuse, (NE) absent with non-excuse.

Student gets an (E) or (NE) grade in a course if he/she does not attend the final examination in that course.

The current GPA is an average determined by calculating each grade awarded during one semester study and cumulative GPA is the GPA for the 10 semesters.

$$\text{Cumulative GPA} = \frac{\sum \text{Grade points} \times N^{\circ} \text{ Cr.s}}{\sum \text{Cr.s}}$$

- **Graduation Grade:**

A candidate's graduation grade is based on the cumulative GPA, which might be not less than 60%.

- **The Number of Repetition Times:**

Students are allowed to re-register any course (i.e., fully re-scheduled) but not more than three times per academic decision (whether mandatory or elective course) and so to correct any repetition of estimates BL, F, NE, or DN



### 9. Methods and Rules of Student's Evaluation:

Methods	Program Intended Learning Outcomes
Written / Online Exams	Knowledge & Understanding and Intellectual Skills (+ Professional skills if course contains case studies)
Written / Online Quizzes	Knowledge & Understanding and Intellectual Skills (+ Professional skills if course contains case studies)
Oral Exams	Knowledge & Understanding, Intellectual Skills, Professional Skills and General Skills
Practical / Online Practical exams	Intellectual Skills and Professional & Practical Skills (+General Skills in Some Courses)
Assignments/ Practical & Tutorial Activities/ Field Projects	Knowledge & Understanding, Intellectual Skills, Professional Skills and General Skills
Graduation Project	Competencies

### 10. Evaluation of Program Intended Learning Outcomes:

Evaluator	Tool	Sample	% Contribution in Total Marks of Program Evaluation
5 <sup>th</sup> Year Students	Questionnaires and Periodic Meetings	Questionnaires (20%)	25%
Graduate students	Questionnaires and Periodic Meetings	Questionnaires (20%)	25%
Stakeholders (Employers)	Questionnaires and Periodic Meetings	One meeting / year	25%
External Evaluator	Reviewing of the specifications of the program and the courses according to the bylaw	At least one reviewer professor in the specialty	25%

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