

Faculty of

**Pharmacy**

# Faculty of Pharmacy

## History

Faculty of Pharmacy at Beirut Arab University was established in 1986, in Beirut, the capital of Lebanon. The undergraduate program at the Faculty of Pharmacy started and progressed to include seven academic departments:

- Analytical Chemistry & Drug Quality Control
- Pharmaceutical Chemistry
- Pharmacognosy & Medicinal Plants
- Pharmaceutics & Pharmaceutical Technology
- Pharmacology
- Pharmaceutical Microbiology
- Clinical Pharmacy

The faculty has observed considerable growth in number of its students that increased from a total number of 115 in 1986 to a total of 408 in the academic year 2009 / 2010.

Since 2002, the faculty has been expanding its curriculum to incorporate postgraduate programs including: Master and PhD Degrees, in addition to a Diploma in Clinical Pharmacy and Doctor in Pharmacy (Pharm.D.) programs.

Since its establishment, the faculty has adopted the extended academic year system, then in 1999, it moved to the two academic terms scheme. In 2002, the faculty updated its programs and adopted the "Credit Hour System". The curriculum of this new system prepares students for careers in different domains of Pharmacy and promotes interaction between pharmacists and other health professionals. Currently, a thorough inspection of the current curriculum is on-going for improvement to meet the national and international needs.

Moreover, the faculty established a "Pharmaceutical Continuing Education Program" which includes short courses, seminars and presentations in the various Pharmaceutical fields that offer graduates and the community a venue for maintaining up-to-date knowledge

## Vision

To be recognized as a premier academic institution in pharmacy education, academic research and community involvement.

## Mission

Faculty of Pharmacy at Beirut Arab University, is an educational and scientific Lebanese institution committed, since its foundation in 1986, to provide advanced services in pharmaceutical education, research, and training, to prepare competent pharmacists capable of effective participation in different pharmacy domains locally, regionally, and internationally, life - long self learning, and the establishment of a strong relationship with the surrounding society in frame of professional code of ethics. To achieve its mission, Faculty of Pharmacy depends on highly qualified staff members, distinguishable laboratory facilities and modern educational tools.

## Postgraduate Programs

### *Offered Degrees*

The Faculty of Pharmacy offers the following postgraduate degrees:

Diplomas in: Biochemical Analysis, Hospital Pharmacy and Clinical Pharmacy

Doctor in Clinical Pharmacy (Pharm.D.)

Master Degree in Pharmaceutical Sciences

Doctor of Philosophy in Pharmaceutical Sciences (PhD)

Both the Master and PhD Degrees are offered in the following specialization:

Analytical Chemistry and Quality Control

Pharmaceutical Chemistry

Pharmacognosy and Medicinal Plants

Pharmaceutics and Industrial Pharmacy

Pharmacology, Toxicology and Biochemistry

Pharmaceutical Microbiology

## Program Description

### *Diploma in Biochemical Analysis & Hospital Pharmacy*

The degree requirements consist of a total of 30 credit hours taken as follows:

Mandatory Courses - 18 Cr. Hr.

Faculty Elective Courses - 6 Cr. Hr.

Research Project - 6 Cr. Hr.

### *Diploma in Clinical Pharmacy*

The degree requirements consist of a total of 30 credit hours taken as follows:

Mandatory Courses - 30 Cr. Hr.

### *Doctor in Pharmacy (Pharm. D.) - Duration: One academic year*

The Doctor in Pharmacy Degree consists of a total of 30 credit hours divided as follows:

Mandatory Courses - 24 Cr. Hr.

Thesis - 6 Cr. Hr.

The first and second semesters involve clinical training in accredited hospitals.

### *Doctor in Pharmacy (Pharm. D.2) - Duration: Two academic year*

The Doctor in Pharmacy Degree consists of a total of 38 credit hours divided as follows:

Mandatory Courses - 32 Cr. Hr.

Thesis - 6 Cr. Hr.

The first and second semesters involve course work and the third and fourth involve clinical training in accredited hospitals.

### ***Master Degree in Pharmaceutical Sciences***

The Master Degree Program consists of a total of 36 credit hours divided as follows:

Mandatory Courses - 16 Cr. Hr.

Specialized Elective Courses - 14 Cr. Hr.

Thesis - 6 Cr. Hr.

All specialized Elective Courses are selected in accordance to the field of specialization. Thesis registration starts at the beginning of the third semester.

### ***Doctor of Philosophy in Pharmaceutical Sciences (PhD)***

The PhD Program consists of a total of 40 credit hours divided as follows:

Specialized Elective Courses - 18 Cr. Hr.

Thesis - 22 Cr. Hr.

All specialized Elective Courses are selected in accordance to the field of specialization.

## **Curricula**

### **I. Diplomas**

#### **Diploma in Biochemical Analysis (30 credit hours)**

<b>First Semester</b>			<b>Cr.</b>
<b>PHAR</b>	601	Applied Biochemistry I	3
<b>PHAR</b>	603	Chemical Pathology I	3
<b>PHAR</b>	601	Histology & Physiology	3
<b>PHAR</b>	701	Absorption & Emission Spectroscopy	3
		Elective <sup>1</sup>	4
			16

Second Semester			Cr.
PHAR	602	Applied Biochemistry II	3
PHAR	604	Chemical Pathology II	3
		Elective <sup>1</sup>	8
			14

<sup>1</sup>Selected from the following courses: MATH 665, CMPS 312, PHAR 702, PHAR 703, PHAR 704, PHAR 707.

### Diploma in Hospital Pharmacy (30 credit hours)

First Semester			Cr.
PHAR	605	Pharmaceutical Dosage Forms	4
PHAR	607	Parenterals	2
PHAR	609	Advanced Microbiology	3
PHAR	611	Sera & Vaccines	2
		Elective <sup>2</sup>	4
			15

## Second Semester Cr.

PHAR	606	Pharmaceutical Laws	2
------	-----	---------------------	---

PHAR	608	Hospital Food Analysis	2
------	-----	------------------------	---

PHAR	610	Advanced Applied Microbiology	3
------	-----	-------------------------------	---

		Elective <sup>2</sup>	8
--	--	-----------------------	---

			15
--	--	--	----

<sup>2</sup>Selected from the following courses: PHAR 738, MATH 665, CMPS 312, PHAR 704, PHAR 706, PHAR 737.

## Diploma in Clinical Pharmacy (30 credit hours)

### First Semester Cr.

PHAR	743	Pharmacotherapeutics I	3
------	-----	------------------------	---

PHAR	745	Basic Clinical Pharmacy	2
------	-----	-------------------------	---

PHAR	747	Clinical Lab Investigations	3
------	-----	-----------------------------	---

PHAR	749	Biopharmaceutics	2
------	-----	------------------	---

PHAR	751	Clinical Pharmacokinetics I	3
------	-----	-----------------------------	---

PHAR	753	Pharmacotherapeutics II	3
------	-----	-------------------------	---

			16
--	--	--	----

Second Semester			Cr.
PHAR	748	Pharmaco Epidemiology	2
PHAR	750	Drug Monitoring & Hospital Training	3
PHAR	752	Clinical Pharmacokinetics II	3
PHAR	754	Pharmacotherapeutics III	3
PHAR	756	Pharmacotherapeutics IV	3
			14

## II. Master Degree in Pharmaceutical Sciences (36 credit hours)

First Semester			Cr.
PHAR	701	Absorption & Emission Spectroscopy	3
CHEM	618	Advanced Physical Chemistry for Pharmacists	2
CMPS	312	Data Base Systems for Pharmacists	2
			7

## Second Semester Cr.

<b>PHAR</b>	702	Topics in Chromatographic Techniques	3
-------------	-----	--------------------------------------	---

<b>MATH</b>	665	Biostatistics for Pharmacists	2
-------------	-----	-------------------------------	---

<b>PHAR</b>	704	Scientific Writing & Research Skills	2
-------------	-----	--------------------------------------	---

<b>PHAR</b>	706	Drug Library & Literature Searching	2
-------------	-----	-------------------------------------	---

| 9

## Third & Fourth Semester Cr.

	Specialized Elective Courses <sup>1</sup>	14
--	---	----

| 14

## Research Thesis Cr.

<b>PHAR</b>	799	Thesis	6
-------------	-----	--------	---

| 6

<sup>1</sup>Specialized Elective Courses are selected according to the field of specialization and upon the recommendation of the academic supervisor from the following list: PHAR 703, PHAR 705, PHAR 707, PHAR 708, PHAR 709, PHAR 710, PHAR 711, PHAR 712, PHAR 713, PHAR 714, PHAR 715, PHAR 716, PHAR 717, PHAR 718, PHAR 719, PHAR 720, PHAR 721, PHAR 722, PHAR 723, PHAR 724, PHAR 725, PHAR 726, PHAR 727, PHAR 728, PHAR 729, PHAR 730, PHAR 731, PHAR 732, PHAR 733, PHAR 734, PHAR 735, PHAR 736, PHAR 737, PHAR 738, PHAR 739, PHAR 740, PHAR 741, PHAR 742, PHAR 744, PHAR 755, PHAR 757.

### III. Doctorate & PhD Degrees

#### Doctor in Pharmacy (Pharm D.) (A one - year program: 30 credit hours)

##### First Semester Cr.

PHAR	706 - 763	Advanced Professional Pharmacy Practice	3
------	-----------	---	---

PHAR	706 - 763	Advanced Professional Pharmacy Practice	3
------	-----------	---	---

PHAR	764 (01 - 20)	Elective: Advanced Professional Pharmacy Practice	3
------	---------------	---	---

PHAR	765	Advanced Clinical Pharmacokinetics	3
------	-----	------------------------------------	---

			12
--	--	--	----

##### Second Semester Cr.

PHAR	706 - 763	Advanced Professional Pharmacy Practice	3
------	-----------	---	---

PHAR	706 - 763	Advanced Professional Pharmacy Practice	3
------	-----------	---	---

PHAR	764 (01 - 20)	Elective: Advanced Professional Pharmacy Practice	3
------	---------------	---	---

PHAR	764 (01 - 20)	Elective: Advanced Professional Pharmacy Practice	3
------	---------------	---	---

			12
--	--	--	----

##### Research Thesis Cr.

PHAR	799	Thesis	6
------	-----	--------	---

			6
--	--	--	---

## Doctor in Pharmacy (Pharm D.2) (A two - year program: 38 credit hours)

### First Semester Cr.

PHAR	743	Pharmacotherapeutics I	3
PHAR	745	Basic Clinical Pharmacy	2
PHAR	747	Clinical Lab Investigations	3
PHAR	749	Biopharmaceutics	2
PHAR	751	Clinical Pharmacokinetics I	3
PHAR	753	Pharmacotherapeutics II	3
			16

### Second Semester Cr.

PHAR	746	Pharmacoeconomics	2
PHAR	748	Pharmaco Epidemiology	2
PHAR	750	Drug Monitoring & Hospital Training	3
PHAR	752	Clinical Pharmacokinetics II	3
PHAR	754	Pharmacotherapeutics III	3
PHAR	756	Pharmacotherapeutics IV	3
			16

**Research Thesis****Cr.**

<b>PHAR</b>	799	Thesis	6
-------------	-----	--------	---

| 6

**Doctor of Philosophy in Pharmaceutical Sciences (PhD) 40 credit hours****Cr.**

Specialized Elective Courses <sup>1</sup>	12
---	----

| 12

**Research Thesis****Cr.**

<b>PHAR</b>	899	Thesis	28
-------------	-----	--------	----

| 28

<sup>1</sup>Specialized Elective Courses are selected upon the recommendation of the academic supervisor according to the field of specialization from the following lists: PHAR 801, PHAR 802, PHAR 803, PHAR 804, PHAR 805, PHAR 806, PHAR 807, PHAR 808, PHAR 809, PHAR 810, PHAR 811, PHAR 812, PHAR 813, PHAR 814, PHAR 815, PHAR 816, PHAR 817, PHAR 818, PHAR 819, PHAR 820, PHAR 821, PHAR 822, PHAR 823, PHAR 824, PHAR 825, PHAR 826, PHAR 827, PHAR 828, PHAR 829, PHAR 830, PHAR 831, PHAR 832, PHAR 833, PHAR 834, PHAR 835, PHAR 836, PHAR 837, PHAR 838, PHAR 839, PHAR 840, PHAR 841, PHAR 842, PHAR 843, PHAR 844, PHAR 845, PHAR 846, PHAR 847, PHAR 848, PHAR 849, PHAR 850, PHAR 851.

## Postgraduate Course Descriptions

Mandatory and Elective Courses are grouped together due to their interchangeability in the P / G program.

### ***PHAR 601 - Applied Biochemistry I (3 Cr. : 2 Lec : 2 Lab)***

This is an application course of human biochemistry, which is designed to provide an insight to the normal healthy metabolic processes and on the other hand focusing on the disorders and congenital diseases that result from abnormal defects of these metabolic processes and pathways.

### ***PHAR 602 - Applied Biochemistry II (3 Cr. : 2 Lec : 2 Lab)***

This is an application course of human biochemistry, which is designed to provide an insight to the normal healthy metabolic processes and on the other hand focusing on the disorders and congenital diseases that result from abnormal defects of these metabolic processes and pathways.

### ***PHAR 603 - Chemical Pathology I (3 Cr. : 2 Lec : 2 Lab)***

General laboratory ,Quality Control in Chemical Pathology, Evaluation of Reliability Criteria, Sampling & Storing of different biological samples.

### ***PHAR 604 - Chemical Pathology II (3 Cr. : 2 Lec : 2Lab)***

Organ function tests, Carbohydrates, Lipids, Proteins, Enzymes, Electrolytes, and Hormones. Acid - Base Balance, Tumor Markers, Stones, Biological Fluids, Role of Lab investigation of some important diseases, Miscellaneous and Updating.

### ***PHAR 605 - Pharmaceutical Dosage Forms (4 Cr. : 3 Lec : 2 Lab)***

Dosage forms preparation, quality control, storage, stability tests and expiration.

### ***PHAR 606 - Pharmaceutical Laws (2 Cr. : 2 Lec)***

Laws controlling drugs, drugs lists, toxic and narcotic drugs, handling dangerous materials, storage methods and sampling techniques.

### ***PHAR 607 - Parenterals (2 Cr. : 2 Lec)***

Injectable solutions, methods of preparation, packaging, physical, chemical and microbiological quality control, test of containers of parenterals and storage.

### ***PHAR 608 - Hospital Food Analysis (2 Cr. : 2 Lec)***

Food classes, Sources, sampling, Carbohydrate analysis, Protein analysis, Fat Analysis, Vitamins and mineral analysis.

### ***PHAR 609 - Advanced Microbiology (3 Cr. : 3 Lec)***

Microbial cell structure of function, microbial physiology, pathogenesis, antibiotic resistance and bacterial toxins.

***PHAR 610 - Advanced Applied Microbiology (3 Cr. : 3 Lec)***

General aspect of the viable cell, regulation of gene expression, modern method of genetic engineering and industrial application of genetic engineering.

***PHAR 611 - Sera & Vaccines (2 Cr. : 2 Lec)***

Immunological principals, humoral and cell - mediated immunity, conventional vaccines, modern vaccine technologies, pharmaceutical considerations.

***PHAR 701 - Absorption & Emission Spectroscopy (3 Cr. : 2 Lec : 2 Lab)***

Topics include theory, instrumentation, fundamental laws, deviation and applications of ultraviolet and visible spectrophotometry, molecular fluorescence spectroscopy theory, instrumentation, laws, and applications.

***PHAR 702 - Topics in Chromatographic Techniques (3 Cr. : 2 Lec : 2 Lab)***

High pressure liquid chromatography, gas chromatography, high performance thin layer chromatography, electrophoresis, theory, instrumentation and applications for qualitative and quantitative analysis.

***PHAR 703 - Advanced Course in Drug Analysis (3 Cr. : 2 Lec : 2 Lab)***

Advanced methods in pharmaceutical analysis. Analysis of dosage forms in the presence of different matrices, multicomponent - mixture analysis using different methods, data assessment and presentation.

***PHAR 704 - Scientific Writing & Research Skills (2 Cr. : 2 Lec)***

Topics include: How to write a paper, title, abstract, experimental, results & discussion, references, how to write a thesis, and to make a seminar.

***PHAR 705 - Drug Quality Control (3 Cr. : 2 Lec : 2 Lab)***

Sampling and probability, control chart technique, quality improved management, inter - and intra - Lab control. Establishment and uses of reference values, methods of selection and evaluation, seminars on different pharmacopoeial methods.

***PHAR 706 - Drug Library & Literature Searching (2 Cr. : 2 Lec)***

Types, information resources, literature evaluation, establishment of DIPC, sources, computerized drug information retrieval system, internet, references, medical letters and professional literature.

***PHAR 707 - Modern Topics in Electrochemistry (2 Cr. : 2 Lec)***

Theory of potentiometry, types of electrodes, applications, conductometry, voltammetry, polarography and differential pulse polarography.

***PHAR 708 - Chemometric Methods of Analysis (2 Cr. : 2 Lec)***

Definition, two - component equation, derivatives technique, orthogonal function, least squares method, partial least squares and application to drug analysis.

***PHAR 709 - Modern Techniques in Biological Analysis (2 Cr. : 2 Lec)***

Sample preparations, storage, methods of analysis of drugs in presence of interferences from biological solutions.

***PHAR 710 - Advanced Organic Pharmaceutical Chemistry I (3 Cr. : 2 Lec : 2 Lab)***

Advanced organic and heterocyclic compounds, advanced mechanistic study of organic reactions, special topics in organic chemistry.

***PHAR 711 - Advanced Organic Pharmaceutical Chemistry II (3 Cr. : 2 Lec : 2 Lab)***

Molecular rearrangements, organic functional group preparations and reactions, organic name reactions, and solid phase organic synthesis.

***PHAR 712 - Advanced Medicinal Chemistry I (3 Cr. : 3 Lec)***

Cancer chemotherapy, antibiotics, drug used in neurodegenerative diseases, in all cases the following aspects will be discussed: Historical resume, synthetic approaches, SAR - studies and mode of actions.

***PHAR 713 - Drug Design I (3 Cr. : 2 Lec : 2 Lab)***

This course includes manipulation of structurally specific agents which comprises receptor sites and mode of biological - action of the concerned molecules. It also includes molecular modeling, computer aided drug design and QSAR studies.

***PHAR 714 - Advanced Topics in IR, NMR & Mass Spectrometry (3 Cr. : 2 Lec : 2 Lab)***

Theory of IR, applications for qualitative and quantitative analysis, NMR applications and mass spectrometry.

***PHAR 715 - Isolation & Chromatographic Techniques (4 Cr. : 3 Lec : 2 Lab)***

Isolation of chemical constituents from crude drugs, extraction methods, bioactivity - guided fractionation schemes, art, approaches and methods of crystallization; Advancements in extraction methodologies and in chromatographic techniques.

***PHAR 716 - Quality Control of Crude Drugs & Phytopharmaceuticals (3 Cr. : 2 Lec : 2 Lab)***

The course is designed to enhance the student's basic knowledge of the principles and methodologies of the quality control of crude drugs. The course improves the student's capabilities and problem solving skills in assuring reliability of drugs of natural origin as well as product of DNA technology. Evaluation of recent herbal monographs and establishment of fundamental approaches to design new one.

***PHAR 717 - Spectral & Chemical Characterization of Natural Products (4 Cr. : 3 Lec : 1 Lab)***

Techniques used in characterization, identification, and structure elucidation of different classes of natural products with emphasis on integrated interpretation of these different techniques.

***PHAR 718 - Selected Topics in Natural Products (3 Cr. : 3 Lec)***

Genetically engineered natural products, cytotoxic / anticancer agents of plant origin, natural products as anti - inflammatory drugs; as a source of anti - thrombotic drugs; Allergenic plants; Semisynthetic drugs derived from natural products, poisonous plants and fungi; Natural products as a renewable source of medicinal agents.

***PHAR 719 - Advanced Physical Pharmacy (3 Cr. : 2 Lec : 2 Lab)***

Characterization of macromolecules used as pharmaceutical excipients; Compendial specifications for excipients; Standardization of excipients for quality and safety, drug - excipient interactions, and prodrugs in pharmaceutical formulations.

***PHAR 720 - Drug Delivery Systems (3 Cr. : 2 Lec : 2 Lab)***

Controlled - release drug delivery systems, targeted delivery systems (nanoparticles - liposomes), novel delivery systems (bioadhesive - intelligent polymers - block copolymers micelles) and self regulated delivery systems.

***PHAR 721 - Advanced Biopharmacy & Pharmacokinetics (3 Cr. : 2 Lec : 2 Lab)***

Bioequivalence testing; Methodology guidelines, assay validation methods, and statistical analysis of bioequivalence data. Evaluation and predication of drug permeation.

***PHAR 722 - Selected Topics in Pharmaceutics (3 Cr. : 2 Lec : 2 Lab)***

Biotechnology pharmaceuticals and gene therapy.

***PHAR 723 - Pharmaceutical Technology I******PHAR 724 - Pharmaceutical Technology II (3 Cr. : 2 Lec : 2 Lab)***

Heat transfer and its applications, fluid mechanics, mass transfer and its applications, operations involving particulate solids, size reduction and mechanical separation.

***PHAR 725 - Pharmaceutical Unit Operation I******PHAR 726 - Pharmaceutical Unit Operation II (2 Cr. : 2 Lec)***

Advanced courses in: Flow and transport of fluid, size reduction, size enlargement, size separation, filtration, mixing, emulsification, crystallization, heat generation and transfer, distillation, liquid - liquid extraction, leaching, humidification and air conditioning, evaporation and drying.

***PHAR 727 - Molecular Pharmacology (3 Cr. : 3 Lec)***

The course is specifically concerned with the effect of drugs on cells at the molecular level; as it studies the effect of drugs on enzymes, proteins, amino acids, nucleic acids, chromosomes and genes. This course is considered to be the base for drug use in treatment of diseases, disclosing its side effects, drug interactions and restrictions to its use.

***PHAR 728 - Selected Topics in Toxicology (3 Cr. : 2 Lec)***

This course is concerned with studying the effect of toxic chemical agents and overdoses of drugs in living organisms (humans, animals and microorganisms), placing in the spotlight on toxicokinetics, toxicodynamic and target organ toxicity. It also include studies on addiction and smoking.

***PHAR 729 - Special Topics in Biochemistry (3 Cr. : 2 Lec : 2 Lab)***

Overview of metabolism of lipids, lipoproteins, Amino acids and Heme. Metabolism in starvation and Diabetes mellitus. Collagen structure and synthesis. Coagulation pathway and diseases.

***PHAR 730 - Experimental Pharmacology (2 Cr. : 1 Lec : 1 Lab)***

This course is considered as a base for the study and research on drugs as it focuses on testing the drug on laboratory animals with the goal of demonstrating the drug's effectiveness on whole animals, isolated organs, tissues or single cells. This course also handle different experimental techniques both in vitro and in vivo.

***PHAR 731 - Advanced Course in Pharmaceutical Biochemistry: Part I (3 Cr. : 2 Lec : 2 Lab)***

Overview of metabolism of lipids, lipoproteins, Amino acids and Heme. Metabolism in starvation and Diabetes mellitus. Collagen structure and synthesis. Coagulation pathway and diseases.

***PHAR 732 - Advanced Course in Pharmaceutical Biochemistry: Part II (3 Cr. : 2 Lec : 2 Lab)***

Nucleotide metabolism, recombinant technology, medical biotechnology.

***PHAR 733 - Advanced General Microbiology (3 Cr. : 2 Lec : 2 Lab)***

The course includes lectures covering microbial cell structure and function, microbial physiology, general principles of microbial pathogenesis, adhesion and invasion strategies, antibiotic resistance, bacterial toxins, intracellular survival strategies, and biofilms. The course includes also a series of discussion groups in specialized areas of modern microbiology. In addition, all students in this course are required to present 3 seminars concerning advanced topics in microbiology.

***PHAR 734 - Microbiology Quality Control (2 Cr. : 2 Lec)***

Quality control techniques and instrumentation. Application of methods (including requirements of QC department, product testing), medical gases, hospital - based practice which include: Quality assurance, quality control, pharmaceutical microbiology, statistics, and audit.

***PHAR 735 - Pharmaceutical Microbiology (3 Cr. : 2 Lec : 2 Lab)***

Significance of microorganisms, Morphology and characteristics of microorganisms, staining methods, requirements of microbial growth, cultivation of microorganisms, reproduction of microorganisms, measurement of microbial growth, identification of microorganisms, control of microbial growth, requirements, classification and applications of disinfectants, modes of action of disinfectants, factors affecting activity of disinfectants, evaluation of disinfectant activity and pathogenic microorganisms.

***PHAR 736 - Molecular Techniques (3 Cr. : 2 Lec : 2 Lab)***

The course covers the main area of contemporary molecular biology, including DNA preparation, amplification of DNA using polymerase chain reaction (PCR) techniques e.g. multiplex PCR and inverse PCR, DNA sequencing, analysis of data using different approaches e.g. agarose gel electrophoresis, identification of bacteria and fungi by using molecular methods e.g. 16S rRNA sequencing, DNA hybridization technique, methods of transfer of genetic materials e.g. transformation, transduction, conjugation and electroporation, different methods of in - vitro mutation e.g. site directed mutagenesis, knock out mutation.

***PHAR 737 - Antibiotics & Chemotherapy (2 Cr. : 2 Lec)***

B-lactams, tetracyclines, rifampicins, aminoglycosides, aminocyclotols, macrolides, polypeptides, glycopeptides, miscellaneous antibiotics (chloramphenicol, fucidic acid, etc...) and antifungal antibiotics. Synthetic antimicrobial agents and antiviral drugs.

***PHAR 738 - Fundamentals of Immunology (2 Cr. : 2 Lec)***

Basic concepts in immunity, hypersensitivity both cellular and humoral, tumor and cancer immunology, transplant immunology, autoimmune diseases, serologic procedures.

***PHAR 739 - Medical Bacteriology (1 Cr. : 1 Lec)***

Most of bacterial infectious diseases including those diseases produced by Gram - positive and Gram - negative bacteria, Acid - fast bacteria, Rickettsiae, Chlamydia, Actinomycetes and Mycoplasma species.

***PHAR 740 & PHAR 741 - Seminar******PHAR 742 - Neuropharmacology (3 Cr. : 3 Lec)***

The course aims to study the effect of drugs on the CNS and peripheral neurons with special emphasis on stimulatory and inhibitory drugs, in addition to drugs that create an imbalance in this system. The course include developments in neuro - psychopharmacology studies of anxiety disorders, affective disorders, psychotic disorders, degenerative disorders and eating and sleep behavior.

***PHAR 744 - Immunopharmacology (3 Cr. : 3 Lec)***

This course is concerned with the study of the immunological changes resulting from drug use such as changes that lead to drug sensitization and its treatment using other drugs. It also focuses on the study of the effects of drugs used to suppress the immune system for its application in autoimmune diseases and in organ transplantation.

***PHAR 745 - Basic Clinical Pharmacy (2 Cr. : 2 Lec)***

Health policy, drug policy regulation, hospital pharmacy management and regulations. Pharmaceutical services.

***PHAR 746 - Pharmacoeconomics (2 Cr. : 1 Lec)***

Health economics, application in hospitals and cost effectiveness of pharmaceutical interventions.

***PHAR 747 - Clinical Laboratory Investigations (3 Cr. : 2 Lec : 3 Lab)***

Preparation of patients, sampling and factors affecting laboratory results. Principles of methods and interpretation of laboratory medicine.

***PHAR 748 - Pharmacoepidemiology (2 Cr. : 2 Lec)***

Drug utilization studies, clinical trials, post marketing surveillance, rational and irrational drug use.

***PHAR 749 - Biopharmaceutics (2 Cr. : 2 Lec)***

Different types of drug interactions. Drug delivery system and product selection by the pharmacist.

***PHAR 750 - Drug Monitoring & Hospital Training (3 Cr. : 1 Lec : 6 Pr.)***

Monitoring and assessment of drug-drug interaction, drug-food interaction, Antibiotics and other antimicrobial agents spread and resistance in the hospital. Assessments of drug use in different situations and drug adverse effects.

***PHAR 751 - Clinical Pharmacokinetics I******PHAR 752 - Clinical Pharmacokinetics II (3 Cr. : 2 Lec : 2 Lab)***

Drug pharmacokinetics in special populations, approach to drug dosing, therapeutic monitoring and applications in drug toxicity.

***PHAR 743 - Pharmacotherapeutics I******PHAR 753 - Pharmacotherapeutics II******PHAR 754 - Pharmacotherapeutics III, (3 Cr. : 2 Lec : 3 Lab) / Course******PHAR 756 - Pharmacotherapeutics IV***

Cardiology, Rheumatology. Nephrology. Dermatology. Gastroenterology. Hematology. Respiratory diseases . Neurology and psychiatry. Oncology and infectious diseases.

***PHAR 755 - Pharmacogenetics & Pharmacogenomics (3 Cr. : 3 Lec)***

This course is concerned with influence of genetics and polymorphism on drug pharmacokinetic and pharmacodynamic parameters. The course include genetic influence on certain disease conditions. This course also deals with the basis of gene therapy, and application of genomic technologies to new drug discovery. It focuses on the use of genetic engineering to create drugs and apply them in treatment of certain diseases such as cancer, diabetes, heart problems and atherosclerosis.

***PHAR 757 - Experimental Toxicology (2 Cr. : 1 Lec : 1 Lab)***

The Course aims to Experience different experimental techniques both acute and chronic to test the toxic effects of drugs and preliminary determination of therapeutic, toxic and lethal doses to animals as well as the study of drug effects on animal embryos and lactating animals. It also demonstrates the possibility of occurrence of genetic mutations or malignancies following drug intake.

***PHAR 799 - Thesis******PHAR 760 - 763 - Advanced Professional Pharmacy Practice (3 Cr. : 1 month clinical rotation)***

These are four required clinical rotations (each 3 Credits) in the following departments: Internal Medicine, critical Care Unit, Ambulatory Care and Community Pharmacy.

***PHAR 764 (01 - 20) - Elective: Advanced Professional Pharmacy Practice (4 months, 3 Cr. : 1 month clinical rotation)***

These are three optional clinical rotations (each 3 credits) to be conducted in three selected departments from the following: Emergency Medicine(01), Psychiatry (02), Dermatology (03), Nephrology (04), Cardiology (05), Bone Marrow Transplant (06), Oncology (07), Infectious Diseases (08), Nutrition (09), Neonatal Intensive Care (10), Obstetrics / Gynecology (11), Gastroenterology (12), Pediatrics (13), Orthopedics (14), Endocrinology (15), Neurology (16), Family Medicine (17), Pulmonary Medicine (18), Pediatric Oncology (19), Neonatal Intensive Care (20).

***PHAR 765 - Advanced Clinical Pharmacokinetics (3 Cr. : 2 Lec : 2 Lab)***

Drug pharmacokinetics in special populations, approach to drug dosing, therapeutic monitoring and application in drug toxicity.

***PHAR 799 - Research Thesis (6 Cr.)***

***PHAR 801 - Research Project (3 Cr. : 3 Lec)***

This course takes advantage of efficient and high - quality instruction methodologies to ensure that students are able to complete the requirements for the doctoral degree within a certain set amount of time.

***PHAR 802 - Modern Theories in Drug Analysis (3 Cr. : 3 Lec)***

Advanced techniques including chiral separation of drugs, use of enzymes in clinical analysis, stability studies and kinetic determination of drugs.

***PHAR 803 - New Automation Systems Used in Analysis (3 Cr. : 3 Lec)***

Introduction of automation system in drug analysis, application of automation system in different techniques, use of pre - and post column derivatization techniques in automation system.

***PHAR 804 - Advanced Analytical Techniques (2 Cr. : 2 Lec)***

Application of inclusion complexes in drug analysis using spectrophotometry and spectrofluorometry, micellar electro kinetic capillary chromatography in drug analysis.

***PHAR 805 - New Methods for Paramedical Analysis (2 Cr. : 2 Lec)***

Analysis for preservatives, antioxidants and coloring agents using different techniques. Cosmetics and nutraceutical analysis.

***PHAR 806 - Modern Concepts on Pharmaceutical Analysis & Computer Sciences (3 Cr. : 3 Lec)***

Non - parametric linear regression of spectrophotometric and chromatographic peak responses in non - ideal conditions, H - point standard addition method, comparison of graphical and numerical methods in multi - component analysis.

***PHAR 807 - Total & Retrosynthesis of Pharmaceutical Compounds (2 Cr. : 2 Lec)***

Classical and retro - synthetic routes are widely used for preparation of some medicinally useful drugs.

***PHAR 808 - Advanced Stereochemistry (2 Cr. : 2 Lec)***

It is the branch of chemistry concerned with the three dimensional aspects of molecules. It is the chemical studies that take into account the spatial aspects of molecules.

***PHAR 809 - Pericyclic & Cyclo - Addition Reactions (2 Cr. : 2 Lec)***

Pericyclic reactions represent an important class of concerted (single step) processes involving  $\pi$  - system. Cycloaddition reaction, particularly the Diels - Alder reaction, are introduced as a versatile synthetic method.

***PHAR 810 - Advanced Heterocyclic Chemistry (2 Cr. : 2 Lec)***

The principle aim of this course is the study of fundamentals of heterocyclic reactivity and synthesis in a way which is standable by undergraduate and postgraduate students.

***PHAR 811 - Synthetic & Natural Pharmaceutical Polymers (2 Cr. : 2 Lec)***

Polymers have multitude of uses, from the foam coffee cup to the life saving artificial heart valve. Some important pharmaceutical polymers will be discussed.

***PHAR 812 - Synthesis of Peptides, Nucleotides & Related Drugs (2 Cr. : 2 Lec)***

This section is concerned with the study of the properties and synthesis of some selected important peptides and nucleotides.

***PHAR 813 - Modern Theories in Drug Design (2 Cr. : 2 Lec)***

It is the theoretical aspects of the drug design process. Drug design requires certain knowledge of biological systems and how they are modulated and an appreciation of the physicochemical properties and structure of molecules.

***PHAR 814 - Selected Topics in Molecular Genetics (2 Cr. : 2 Lec)***

This course consists of lectures and discussions about recent advances in molecular genetics. These topics include, with emphasis on genetic aspects, the following: Sporulation and differentiation, bacterial pathogenicity, recombination, cell growth and division, DNA replication and site specific mutagenesis.

***PHAR 815 - Modern Theories in Bio - Deterioration & Bio - Degradation (3 Cr. : 3 Lec)***

This course dealing with the role of microorganisms in the bio - deterioration and biodegradation of polymers and waste products (Pollutants).

***PHAR 816 - Advanced Applications of Biotechnology (3 Cr. : 3 Lec)***

The course deals with the application of biotechnology for industrial purposes, including the manufacturing, alternative energy (Bio - energy), and biomaterials. It includes the practice of using cells or compounds of cells like enzymes to generate industrially useful products.

***PHAR 817 - New Researches in Virology (2 Cr. : 2 Lec)***

Detailed description of the molecular virology research, special issues in advances in pathogenic viruses (hepatitis B and C, etc), Virology and biotechnology.

***PHAR 818 - Advanced Biopharmaceutics & Pharmacokinetics (2 Cr. : 2 Lec)***

Advanced Biopharmaceutics and pharmacokinetics concentrates on advanced drug delivery systems and advanced mathematics of biopharmaceutics and pharmacokinetics.

***PHAR 819 - Molecular Pharmaceutics (2 Cr. : 2 Lec)***

Molecular pharmaceutics deals with the integration of application of high quality, mechanisms including biosensors and application of cell molecular biology.

***PHAR 820 - Pharmaceutical Biotechnology (2 Cr. : 2 Lec)***

Pharmaceutical Biotechnology deals with the production of rare or even unattainable pharmaceuticals in useful quantities by harnessing the power of molecular biology. Products can be produced from raw materials with the aid of organisms.

***PHAR 821 - Tissue Engineering (2 Cr. : 2 Lec)***

Tissue engineering focuses on the development of substitutes for damaged tissues and organs. It combines the principles of engineering and biology to aid in the formation of new tissues or in the implantation of functional cells.

***PHAR 822 - Bioinformatics from a Pharmaceutical Prospective (2 Cr. : 2 Lec)***

It covers major databases and software programs for genomic data analysis with an emphasis on the theoretical basis and practical applications of computational tools.

***PHAR 823 - Selected Topics in Industrial Pharmacy (3 Cr. : 3 Lec)***

Selected topics in industrial pharmacy deals with special topics in selected areas of industrial and physical pharmacy and pharmaceutical radioisotopes.

***PHAR 824 - A Mechanistic Biosynthetic & Ecological Approach to Natural Products Chemistry (3 Cr. : 3 Lec)***

Principal reactions and pathways of biosynthesis concerning chemical ecology and basic reaction mechanisms in biological chemistry of natural products such as redox, elimination and carbonium ion rearrangements.

***PHAR 825 - Advanced Techniques in Drug Technology (3 Cr. : 3 Lec)***

Technology platform that combines artificial intelligence, advanced computational methods and chemical diversity techniques to discover new drugs, drug delivery techniques often requires multifunctional capabilities, biocompatible, developed and advanced biomedical polymers for healthcare applications, radiation sterilization of advanced drug device, new drug delivery good for alder drugs.

***PHAR 826 - Biotransformation of Natural Products (3 Cr. : 3 Lec)***

Application, both actual and potential, of biological catalysts for the synthesis, inter - conversion or degradation of chemical species of natural products.

***PHAR 827 - Pharmacobiotechnology of Natural Products (3 Cr. : 3 Lec)***

Technological applications using biological systems, living organisms, or derivatives thereof, to make or modify natural products for specific uses.

***PHAR 828 - Advanced Biochemistry (3 Cr. : 3 Lec)***

Advanced topics in biochemistry, including enzyme action, metabolic disorders, membrane transport, nerve and muscle functions, and photosynthesis.

***PHAR 829 - Advanced Selected Topics Related to the Point of Research (3 Cr. : 3 Lec)******PHAR 830 - Cell Signaling (2 Cr. : 2 Lec)***

The course describes cells' communication through discrete signaling pathways to influence one another's differentiation, proliferation, secretion, and apoptosis. Recent studies of cell signaling mechanisms have led to a greater understanding of many diseases and to new therapeutic strategies.

***PHAR 831 - Advanced Topics in Neuropharmacology (3 Cr. : 3 Lec)***

Selected topics in the field of neuro - pharmacology. These Topics are carefully selected to be in line with the latest technological and scientific advancements worldwide.

***PHAR 832 - Protein Structure & Function (3 Cr. : 3 Lec)***

An advanced study of the chemistry of proteins and protein - containing supra - molecular structures. The topics include isolation and purification of proteins, structure of proteins and relation of structure to biological function.

***PHAR 833 - Physiological & Biochemical Bases of Human Nutrition (3 Cr. : 3 Lec)***

Examines the biochemical and physiological bases of human nutritional requirements. Uses an integrated approach to cover the digestion and metabolism of nutrients (carbohydrates, proteins, lipids, vitamins, and minerals). Metabolic and chronic diseases related to nutrition are discussed throughout the semester.

***PHAR 834 - Departmental Seminar & Journal (1 Cr. : 1 Lec)***

Discussion of recent topics in pharmacology and toxicology by faculty or invited outside speakers. Students research reports.

***PHAR 835 - Steroid Hormones (2 Cr. : 2 Lec)***

Structure of steroid hormones, synthesis, function, and diseases related to steroid hormones.

***PHAR 836 - Advanced Biochemical Techniques (3 Cr. : 3 Lec)***

The techniques of molecular biology are applied to address questions in pharmacology. Molecular cloning and gene expression technology are applied both to cells in culture as well as to intact organisms to identify new drug targets and understand the molecular mechanism of action of drugs.

***PHAR 837 - DNA / Protein Interaction (2 Cr. : 2 Lec)***

Study of proteins and peptides that target specific motifs in proteins, to define the domains of amino acids critical for such interactions, and to score specific drug - mediated disruption of protein - protein interaction. It also involves a study of the interactions between DNA and proteins, RNA and proteins, and between small molecules / drugs and proteins.

***PHAR 838 - Current Topics in Molecular Biology (1 Cr. : 1 Lec)***

Comprehensive overview of the cellular and molecular mechanisms of drug and chemical actions on the major organ systems of humans and other mammals.

***PHAR 839 - Vaccine Technologies (3 Cr. : 3 Lec)***

Vaccine technology is based on the use of modern immunology to develop recombinant DNA vaccines for improved disease control against lethal diseases.

***PHAR 840 - Molecular Immunology (3 Cr. : 3 Lec)***

This course deals with molecular mechanisms underlying immune response in diseased including autoimmune diseases.

***PHAR 841 - Microbial Contamination Control in the Pharmaceutical Industry (3 Cr. : 3 Lec)***

This course discusses major issues regarding testing and quality control in pharmaceutical manufacturing, which will ensure product and process integrity.

***PHAR 842 - Biotechnology of Antibiotics (3 Cr. : 3 Lec)***

Use of molecular biology and recombinant DNA technology to influence specific biological processes largely related to meeting human needs.

***PHAR 843 - Advanced Topics in Experimental Pharmacology (3 Cr. : 2 Lec : 1Lab)***

Selected studies on new experimental techniques in selected areas of pharmacology relevant to the candidate study specialty.

***PHAR 844 - Advanced Topics in Molecular Pharmacology (3 Cr. : 3 Lec)***

The department selects a diversity of Topics in the field of molecular pharmacology. These Topics are carefully selected to be in line with the latest technological and scientific progress worldwide.

***PHAR 845 - Advanced Topics in Immunopharmacology (3 Cr. : 3 Lec)***

The department selects a diversity of topics in the field of immunopharmacology. These Topics are carefully selected to be in line with the latest technological and scientific advancements worldwide.

***PHAR 846 - Advanced Topics in Pharmacogenetics & Pharmacogenomics (3 Cr. : 3 Lec)***

The course deals with selected topics of latest advances in the field of pharmacogenetics and pharmacogenomics.

***PHAR 847 - Research Topics in Cardiovascular & Renal Pharmacology (3 Cr. : 3 Lec)***

Selected studies on research articles relevant to the specialty in cardiovascular and renal pharmacology, with continuous follow up to the latest work in this field.

***PHAR 848 - Research Topics in Neuromuscular Pharmacology (3 Cr. : 3 Lec)***

Selected studies on research articles relevant to the specialty in neuromuscular transmission in different types of smooth and skeletal muscles with continuous follow up to the latest work in this field.

***PHAR 849 - Research Topics in CNS Pharmacology (3 Cr. : 3 Lec)***

Selected studies on research articles relevant to the specialty in CNS with continuous follow up to the latest work in this field.

***PHAR 850 - Research Topics in GIT Pharmacology (3 Cr. : 3 Lec)***

Selected studies on research articles relevant to the specialty in GIT, liver and relevant new insights in disease management, with continuous follow up to the latest work in this field.

***PHAR 851 - Advanced Phytotherapy (3 Cr. : 3 Lec)***

Recent phytochemical and biological researches in the field of newly discovered global medicinal plants and possible use of their extracts and bioactive products as new sources of medicinal drugs.

***PHAR 899 - Thesis***