Faculty of
Pharmacy and Pharmaceutical Sciences
University of Karachi

Years of Excellence

CATALOGUE 2025

Undergraduate Program

Celebrating **60 years** of legacy and leadership

01

Legacy & Recognition

Established in **1964**

over 60 years of academic and research excellence.

FIRST FACULTY OF PHARMACY IN PAKISTAN **1973**

- One of the **largest and oldest faculties** in Pakistan in terms of area, infrastructure, and enrollment.

Ranked among the top

150–200

pharmacy faculties worldwide.

- Set the benchmark for pharmacy education and institutional development
- Pioneering force behind the foundation of number of pharmacy colleges and faculties, shaping the nation's pharmaceutical education landscape.
- Spearheading curriculum development and academic leadership nationwide.

02

Academic Strength

Faculty comprises of

Highly Qualified

Ph.D. holders from reputed institutions, bringing extensive academic, research, and professional experience.

over

13000

graduates contributing globally in academia, pharmaceutical industries, hospitals, community pharmacy, and regulatory sectors.

Around **2000** students study undergraduate and postgraduate programs annually, reflecting its strong academic capacity.

- Alumni network shaping pharmacy education and research across Pakistan.

Purpose-built, spacious

Academic Buildings

provide an environment that supports effective student learning

To sustain its role as a center of excellence in pharmaceutical education and research, promoting innovation, scientific collaboration, and global impact in health sciences.

03

Research Excellence

- **Thousands of research papers** published in national and international journals.
- **Number of books** on various topics authored by the faculty.

Faculty publishes two leading journals

Pakistan Journal of Pharmaceutical Sciences (PJPS)
an impact factor journal established in

1988

advancing global editorial excellence.

- **Pakistan Journal of Pharmacology,** established in

1985

04

Research Centers & Facilities

1996

Research Institute of Pharmaceutical Sciences (RIPS), promoting advanced and collaborative pharmaceutical research.

2016

Bioavailability and Bioequivalence Research Facility (BBRF), offering bioavailability and regulatory testing to national and multinational industries.

2024

Tibbe-E-Nabavi (SAW) Research Lab of Herbal Drugs and Cosmeceuticals

CATALOGUE
2025
Undergraduate Program

FACULTY OF PHARMACY AND
PHARMACEUTICAL SCIENCES
University of Karachi, Karachi-75270

In the Name of Allah, the Most Beneficent, the Most Merciful

The catalogue 2025 provides criteria for selection of students, detailed syllabi of prescribed courses, schedule of teaching, protocol for examinations, grading system, and conditions for the award of degree. Introduction of the departments, introduction of the faculty members, facilities available, details of co-curricular activities etc.

Students are advised to read it carefully and act accordingly so as to get acquainted with all the necessary information with respect to their faculty and profession.

O My Lord! increase me in knowledge
Quran (20:114)

And when I am sick, He who heals
Quran (26:80)

Advice of the Quaid to Students

"My young friends, I look forward to you as the real makers of Pakistan. Do not be exploited and do not be misled. Create amongst yourself complete unity, solidarity and discipline. I assure you: "Divided you fall, United you stand". Set an example of what youth can do. If you fritter away your energies now, you will always regret. You must now realize that fresh fields, new channels and avenues are now being thrown open to you, where you have unlimited opportunities, namely, you must now direct your attention to science, commercial banking, insurance, industry and technical education. After you leave the portals of your universities and colleges then you can play your part freely and help yourself and the state".

March, 1948

Quaid e Azam Mohammad Ali Jinnah

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Message from the Vice Chancellor, University of Karachi

It is heartening to see that the faculty of Pharmacy and Pharmaceutical Sciences continues its tradition of publishing the 2025 catalogue to guide the newly admitted students. This initiative reflects the faculty's dedication to fostering a welcoming environment, and strengthening the bond between teachers and students.

The catalogue serves as a comprehensive guide, offering valuable insights into faculty members, the syllabus, departmental details, and both curricular and co-curricular activities. I am confident that this resource will greatly assist students in navigating their academic journey and encourage them to uphold the faculty's rules and regulations.

I commend the faculty for their tireless efforts and unwavering commitment to supporting students and contributing to their academic and personal growth.

Prof. Dr. Khalid Mahmood Iraqi

Message from the Dean,
Faculty of Pharmacy and Pharmaceutical Sciences University of Karachi

It is with great pleasure that I welcome you to the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, for the academic year 2025. You are about to embark on a remarkable journey in the Doctor of Pharmacy (Pharm.D.) program—a profession committed to advancing health, enhancing patient care, and shaping the future of healthcare through the art and science of medicines and pharmaceutical care.

Our faculty stands on a proud legacy of over six decades of academic excellence, pioneering research, and dedication to producing leaders in pharmaceutical sciences. We continuously evolve our curriculum and training approaches to meet the dynamic needs of the pharmaceutical industry and the healthcare system, equipping you with the knowledge, skills, and ethical grounding necessary to excel as a modern pharmacist in Pakistan and beyond.

Here, you will learn from experienced faculty, engage with innovative research, and develop practical expertise through intensive laboratory training, industry-oriented curricula and exposure to pharmacy practice, Beyond the classroom, I encourage you to embrace the University's vibrant campus life—participating in student clubs and societies, professional events, and activities that will enrich your personal and professional growth.

The journey ahead will be both challenging and rewarding. Success will require commitment, curiosity, and resilience. Remember, every step you take here is shaping you into a capable, compassionate, and forward-thinking professional who will make a tangible difference in people's lives.

On behalf of the faculty and staff, I welcome you once again to the Faculty of Pharmacy and Pharmaceutical Sciences. We look forward to supporting and guiding you as you pursue excellence in your academic, professional, and personal endeavors.

Wishing you a successful and inspiring journey ahead.

Prof. Dr. Muhammad Harris Shoaib

Introduction
University of Karachi

The University of Karachi was established in 1951 under a charter of the Central Government. Until 1959, it was housed in a rented building situated in a congested area of the city. In 1960, it was relocated to the present campus, sprawling over an area of nearly two square miles. The campus has since been growing steadily. In its present state, it affords many facilities to the students and strives hard with a vision to become a modern, well-equipped University town for the students that their successors will be proud of.

Altogether over 25,000 regular students are enrolled in 58 departments functioning under 9 faculties: Arts, Science, Engineering, Administrative and Management Sciences, Education, Islamic Learning, Law, Pharmacy and Pharmaceutical Sciences, and Medicine as well as 20 research institutes and centers. More than 150 colleges are affliated with the University, and therefore University of Karachi is an affliating, examining and teaching body, and hence caters to the teaching requirement of over 25 million population of the city.

The University has the best teaching staff consisting of more than 800 teachers. Most of the teachers are highly qualified, having Ph.D. and D.Sc. degrees from Pakistan and abroad, and out of them, some are of international fame. University, being located in the port city of Karachi, serves as the window of higher education in Pakistan. The University has acquired a high status in the field of education in Pakistan as well as abroad within a span of 70 years. Presently it occupies a prominent place especially in teaching and research in Science, Pharmacy, Administrative and Management Sciences and Medicine.

The University, on its part, provides good facilities to promote learning. The University library, for instance, is stocked with the latest books in various fields and is virtually a storehouse of information.

A university is a seat of learning; its primary aim is to promote the pursuit of knowledge. Examination and degrees play only a secondary role in its functions. The development of students' minds and character are the lasting acquisitions; the value of degrees and diplomas is only ephemeral.

There are facilities for sports of all kinds to enable the students to develop a spirit of healthy competition. The University gymnasium offers the student ample opportunities to develop their physique, because a healthy mind can reside only in a healthy body.

Beside subject arcades and clubs, there are forums for free and unfettered exchange of views among students. It also helps to foster a spirit of cooperation and offers good training in civic responsibilities. It is a platform for healthy discussion, and while participating in its activities one must see that one should not overstep the limits by indulging in irresponsible and destructive talks and activities. All co-curricular activities are intended to make students' lives richer by increasing their contacts with their fellow students and teachers.

The campus, however, represents only one aspect of the University; the other and more important aspect is the cooperation between the students and the teachers which alone can create a healthy academic atmosphere in the University conducive to learning. Education is a two-way process and it can be accomplished only if the teacher and the student both actively participate in it. Remember that the keenness of the teacher to give is always proportional to the keenness of the student to receive; meaning that the students must bring a good deal of earnestness and enthusiasm to bear upon their studies if they want to reap the maximum benefit from their stay in the University.

Faculty of **Pharmacy and Pharmaceutical Sciences**

Introduction
Faculty of Pharmacy and Pharmaceutical Science

The Faculty of Pharmacy and Pharmaceutical Sciences of the University of Karachi owes its origin from the Department of Pharmacy, which was established in 1964. The Department of Pharmacy in this university was founded in response to the need for a better drug delivery system in hospital and retail pharmacy, and also to cater the ever-growing need of the pharmaceutical industry, as 90 percent of the drug-based industry in Pakistan, both national and multinational, are located at Karachi. The development of pharmacy education at the University of Karachi was very rapid, and in a very short span of time it occupied a prominent position as the largest pharmacy teaching institution, and has made a significant contribution in the development of the pharmaceutical industry. The erstwhile Department of Pharmacy was raised in 1973 into a full-fledged and the first Faculty of Pharmacy in the country which at that time was comprised of 4 teaching and research departments, such as: Pharmaceutics, Pharmaceutical Chemistry, Pharmacology and Pharmacognosy. In 2004, the 4-year B. Pharm. degree was replaced by a 5 years Pharm. D. degree program on the recommendation of Pharmacy Council of Pakistan and Higher Education Commission. As a consequence to this, a fifth department of Pharmacy Practice was launched in 2015. Around 2000 regular students are today pursuing their studies leading to the award of Doctor of Pharmacy (Pharm. D.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.) degrees.

The Faculty of Pharmacy and Pharmaceutical Sciences has so far produced around 13000 B.Pharm. /Pharm. D., and more than 900 post graduates. This constitutes the largest figure of graduates and post graduates from any pharmacy institution of the country. The faculty published thousands of research papers in national and international journals. The Faculty of Pharmacy and Pharmaceutical Sciences has well equipped laboratories in all the departments, which fully cater to the teaching and research needs of the various degree programs. Moreover, there is a good library with an e-library and internet facility. The faculty took another step forward to establish an Institute of Pharmaceutical Sciences under its auspices so as to give more impetus to scientific and technological research and development. This institution has been recently renovated and re-designed keeping in view the current demands of the field.

To cater to the increasing number of students, new buildings for each department, a separate building for the Dean office work constructed and have been operational since 2015.

The Faculty of Pharmacy and Pharmaceutical Sciences of the University of Karachi, in keeping with its tradition and its accomplishments, will continue to carry out its mission as a leading institution to excel higher learning in pharmaceutical sciences in Pakistan.

Contact Details

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Group Photo of the Faculty

Sitting, from L to R: Dr. Iyad Naeem Muhammad, Dr. Rabia Ismail Yousuf, Dr. Muhammad Mohtasheemul Hasan, Dr. Nousheen Mushtaq, Dr. Iqbal Azhar, Dr. Muhammad Harris Shoaib, Dr. Faiyaz H. M. Vaid, Dr. Afshan Siddiq, Dr. S. M. Farid Hassan, Dr. Sohail Hassan.

Standing, from L to R: Ms. Farah Mazhar, Dr. Salman Ahmed, Dr. Kamran Ahmed, Dr. Tazeen Husain, Dr. Faaiza Qazi, Dr. Sadia Ghousia Baig, Dr. Azra Riaz, Dr. Nuzhat Sultana, Dr. Sadaf Farooqi, Ms. Rehana Saeed, Dr. Safila Naveed, Dr. Rubina Siddiqi, Dr. Urooj Nazim, Dr. Shazia Haider, Dr. Asia Naz, Dr. Safia Abidi, Dr. Maryam Ahmed, Dr. Farrukh Rafiq Ahmed, Dr. Adnan Iqbal.

Vision and Mission of the Faculty

• Vision

As an epitome of pharmacy research and innovation, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi envisions to transform pharmacy education and research to health care service. Our core vision is to prepare leading pharmacists and pharmacy graduates who will be able to compete globally and be socially responsible to drive advance patient care. We are working with the vision to inspire our upcoming generation and to expand the perimeter of the pharmacy practice and pharmaceutical sciences.

• Mission

Our faculty is committed to fostering an innovative academic environment, and effectuate to prepare competent and compassionate professionals well equipped with pharmacy knowledge, skills, and ethical values. University of Karachi is leading institution in pharmacy and pharmaceutical sciences, providing quality education and training for decades. We are passionate to respond to the evolving local and global needs of the pharmacy profession through collaborative partnership with health care set ups and pharmaceutical manufacturers. We strive to prepare our pharmacy graduates to remarkably contribute to public health and pharmaceutical sciences.

Board of Faculty

Prof. Dr. Muhammad Harris Shoaib
Dean
Faculty of Pharmacy & Pharmaceutical Sciences
University of Karachi

Prof. Dr. Zaheer Qasmi
HEJ Research Institute of Chemistry
University of Karachi

Prof. Dr. Tanveer Abbas
Department of Microbiology
University of Karachi

Prof. Dr. Shamim A. Qureshi
Chairperson, Department of Biochemistry
University of Karachi

Prof. Dr. Faiyaz H M Vaid
Chairman
Department of Pharmaceutical Chemistry
University of Karachi

Prof. Dr. Nousheen Mushtaq
Department of Pharmaceutical Chemistry
University of Karachi

Prof. Dr. Muhammad Mohtasheem ul Hasan
Chairman
Department of Pharmacognosy
University of Karachi.

Prof. Dr. Syeda Afroz
Department of Pharmacology
University of Karachi

Prof. Dr. Afshan Siddiq
Chairperson
Department of Pharmacology
University of Karachi

Prof. Dr. Sohail Hassan
Department of Pharmaceutical Chemistry
University of Karachi

Prof. Dr. S.M. Farid Hassan
Chairman
Department of Pharmaceutics
University of Karachi

Prof. Dr. Rabia Ismail Yousuf
Department of Pharmaceutics,
University of Karachi.

Prof. Dr. Iyad Naeem Mohammad
Coordinator
Department of Pharmacy Practice
University of Karachi

Prof. Dr. Asia Naz
Department of Pharmaceutical Chemistry
University of Karachi

Prof. Dr. Safila Naveed
Department of Pharmaceutical Chemistry
University of Karachi

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Board of Faculty

Prof. Dr. Rabia Bushra
Department of Pharmaceutics
University of Karachi

Prof. Dr. Huma Shareef
Department of Pharmacognosy,
University of Karachi

Dr. Farya Zafar
Associate Professor
Department of Pharmceutics
University of Karachi

Dr. Azra Riaz
Associate Professor
Department of Pharmacology
University of Karachi

Dr. Maryam Ahmed
Associate Professor
Department of Pharmacognosy
University of Karachi

Ms. Farah Mazhar
Assistant Professor
Department of Pharmacognosy
University of Karachi

Dr. Sadia Ghousia Baig
Assistant Professor
Department of Pharmacology
University of Karachi

Ms. Rehana Saeed
Assistant Professor
Department of Pharmaceutics
University of Karachi

Dr. Shazia Haider
Assistant Professor
Department of Pharmaceutical Chemistry
University of Karachi

Dr. Tazeen Hussain
Lecturer
Department of Pharmaceutics
University of Karachi

Dr. Adnan Iqbal
Lecturer
Department of Pharmacology
University of Karachi.

Pharm. D. Program

Student Facilities

1. **Foreign Students**

   Faculty of Pharmacy and Pharmaceutical Sciences admits 20 foreign students to Pharm. D. degree course every year. These admissions are not given directly but only after being duly processed by the concerned Embassies and the Ministry of Economic Affairs in Islamabad.

2. **Co-Curricular Activities**

   a Annual Tour

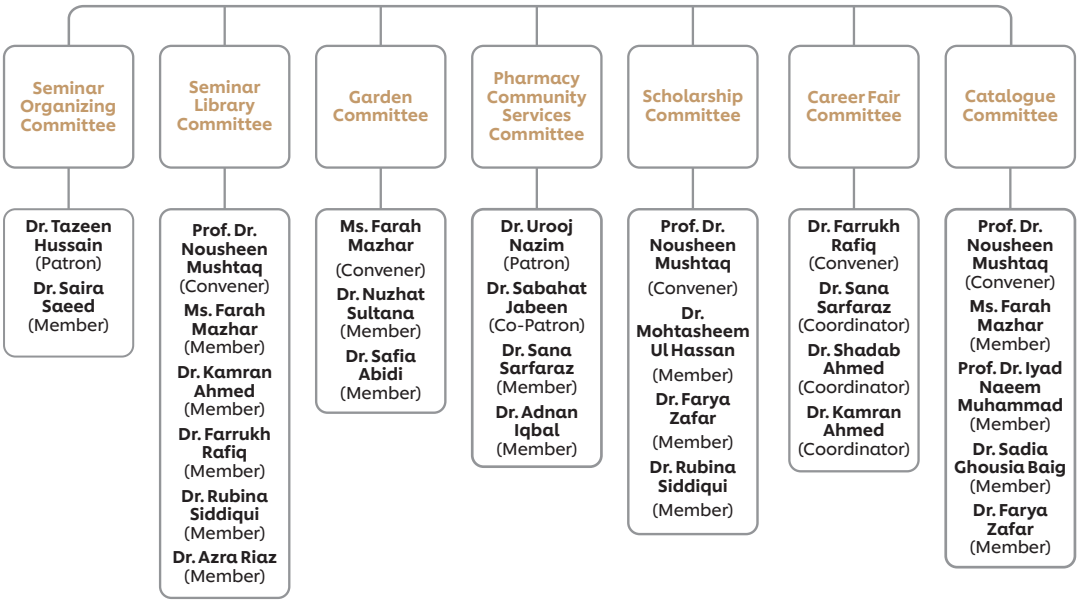
   Students of Pharm. D. final year tour the country as a part of their training to get acquainted with the various pharmaceutical industries as well as various Pharmacy Institutions (Public Sector) of the country along with sight seen of our beautiful Pakistan, while the junior students visit the local industries.

   b. Pharmacy Students Clubs

   Karachi University Pharmacy Students Club (KUPSC) came into being in 2013, exclusively for pharmacy students. Each Club has a number of enrolled students for participating and organizing different events related to sports, literature, drama, science, and leisure activities. KUPSC is looking after these areas under the supervision of faculty members as their patrons.

   c. Committees of Faculty of Pharmacy

   In order to run the faculty smoothly and efficiently in a healthy environment and to enhance the overall quality of the faculty, different committees have been established. These committees are comprised of energetic faculty members, who along with student(s) fulfill the tasks assigned to them.



d. Faculty of Pharmacy Students Advisors

In order to deal with the day today problems of the students and to maintain discipline in the faculty, highly skilled and energetic faculty members have been appointed as student advisors. They also facilitate and collaborate with the clubs and committees in organizing different programs.

List of Student Advisors

- Dr. Shadab Ahmed
- Dr. Sana Sarfaraz
- Dr. Farrukh Rafiq
- Dr. Kamran Ahmed
- Dr. Sadaf Farooqi
- Dr. Urooj Nazim
- Dr. Safia Abidi

3. Incentives and Assistance

a. President's Award

Ministry of Health, Government of Pakistan gives this medal to the student who tops in overall performance during the 5 years Pharm. D. courses.

b. Research Fellowships

University of Karachi, the Higher Education Commission and Pakistan Science Foundation grant fellowships for talented students enrolled for M. Pharm., M.Phil. and Ph.D. programs.

c. Scholarships and Fee Remissions

Needy and deserving undergraduate students are given full-fee/half-fee remissions through some of the recently initiated scholarships.

d. Duty Loan

These interest-free loans are granted by Banker's Equity of Pakistan to outstanding and deserving students. Moreover, Pakistan Fauji Foundation and other social and cultural organizations give financial assistance to needy students.

4. **Hospital Training**

Memorandum of Understanding (MoUs) with hospitals, such as National Institute of Blood Diseases (NIBD), Holy Family, Darulsehat, Liaquat National, Patel, and Children Hospital have been made for professional training of Pharm. D. (Final year) students.

5. **Gold Medals**

- **Hakimsons Chemical Industries** Gold Medal is awarded to a student, who performs best in the 5 years Pharm. D. degree courses.
- **Prof. S.M.S. Zoha** Gold Medal is awarded to a student who secured best CGPR in Pharmacy at the B. Pharm. / Pharm. D. examinations.
- **Fauzia Rashid** Gold Medal is received by a student who stands first in the Pharm. D. examinations.
- **Amna Feroz** Gold Medal goes to a student who stands first at the B. Pharm. / Pharm. D. examinations.
- **Al-Haj Ikram Siddiqui** Gold Medal goes to the most outstanding M. Pharm. student of the faculty.

Publications

1. **Pakistan Journal of Pharmaceutical Sciences**

The Pakistan Journal of Pharmaceutical Sciences (PJPS) is the offcial bi-monthly publication of the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. It publishes high quality, peer reviewed articles on related subjects. PJPS has Impact Factor 0.692 and its contents are indexed and abstracted in the Chemical Abstracts, MEDLINE/PubMed, Index Copernicus, Index Medicus, CAB Abstracts, ISI, Global Health, Pubget, SADCCT, NLM LocatorPlus, GDPBM, IMEMR, SCImago, EVISA, Serial Cited, EBSCO, PDB, IndexPharmacus, AsiaNet, ResearchGate and PakMediNet.

2. **Pakistan Journal of Pharmacology**

Recently the rights and authority of the Pakistan Journal of Pharmacology has been delegated to the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. Every year two issues of the journal are published under the supervision of the Dean.

3. **Farmacia**

Faculty of Pharmacy and Pharmaceutical Sciences also publishes a bi-lingual magazine "Farmacia" annually, which comprises articles on various topics on pharmacy as well as covers various activities and events involving students, held in the faculty of Pharmacy and Pharmaceutical Sciences. Farmacia also publishes interviews of the faculty members. This magazine is published on regular basis, and students of faculty of the Pharmacy and Pharmaceutical Sciences participate in it with their articles in both Urdu and English languages.

4. **Graduate Directory**

A graduate directory of the final year students is prepared and published every year. This directory helps the students to seek jobs of their interest as well as pursue their careers as per their choice and ambition.

Admission & Examinations
Under-Graduate Studies

1. Pharm. D. Admissions

Admissions in Karachi University are given according to merit. There is no discretionary quota for admissions. However, certain seats are reserved for disabled persons and children of university teachers and employees. For these seats also, admissions are given on the criterion of merit.

Admissions on Merit Seats

Prior to granting admission the students are required to appear in a qualifying test in which it is mandatory to score 50% marks. Since the number of applicants is much higher than the number of available seats, under the University rules the applicants have been divided into three categories i.e. K, S, and P.

i. Category "K". Preference shall be given to those applicants, who have passed Secondary School Certificate (SSC) and Higher Secondary Certificate (HSC) or equivalent examinations from an educational institution situated in Karachi and also recognized by the University.
Whereas, for admission in Master's degree program, in addition to the SSC and HSC, preference shall be given to those applicants who have also obtained graduation degree from an academic institution affiliated to the University of Karachi. Five percent (5%) seats have been reserved for applicants who have done their graduation from a non-public sector, degree awarding institute situated in Karachi and recognized by the University of Karachi.

ii. Category "S" comprises those applicants who have passed their pre-requisite examinations from a recognized educational institution in the Province of Sindh (excluding Karachi).

iii. Category "P" comprises those applicants who have passed their pre-requisite examinations from a recognized educational institution outside the Province of Sindh.

Preference in admissions is given to "K" category candidates. In case seats are left, "S" category candidates are considered. If seats are still available then consideration is given to "P" category candidates.

Change of Category

Candidates who fulfill the following conditions can apply for change of category from S or P to K.

i. Those students whose father or mother is domiciled in Karachi, but who have passed the requisite examination from any registered National or International Institution outside Karachi or from any Pakistan Board or University which conducts examinations in foreign countries and they have passed their examination from abroad, such candidates will have to produce their father's or mother's domicile certificate with their applications.

ii. Students whose parents are employees of the Federal or Sindh Governments, or of autonomous or semi-autonomous bodies of Government Corporations, or of the Armed Forces, who have been posted in or transferred to Karachi within the last two years. Such applicants will have to produce the appointment letter or transfer letter of their father/mother together with their applications.

iii. 3% seats in each department will be allocated for those candidates who have passed their pre-requisite examination from a recognized educational institution located outside Karachi but they have their initial education including Matric/Intermediate from Karachi. Such candidates should have Karachi P.R.C. and their parents should have domicile and N.I.C. of Karachi. Candidates below the age of 18 years are required to submit photocopy of 'B' Form.

Application for Change of Category
All such applicants who fulfill the criteria for change to category K, should attach with their forms an application on plain paper for change of category together with their father's/mother's domicile certificate, NIC and appointment/transfer letter. At the time of admission they will have to produce the original and photo copies of all documents.

Admissions on Reserved Seats
Some seats have been reserved for dependents of Karachi University employees, sports and disabled persons. Candidates for admission to these seats should ensure that they meet the criteria of eligibility for the University as well as the concerned department. The candidates will have to submit a separate form for reserved seats.

The merit list for these seats is prepared for different departments on the basis or recommendations by the concerned Committee. It may be mentioned that certain departments have limited the number of students to be admitted on reserved seats because of the unusually large number of applicants. Admission forms for these seats can be obtained from the office of the Deputy Registrar (Academic).

Conditions for Eligibility
The conditions for eligibility for all candidates, whether for merit seats or for reserved/donor's seats are as under:
For admission in the Faculty of Pharmacy and Pharmaceutical Sciences, the candidate should have obtained minimum of 60 per cent marks (B-Grade) in Intermediate/H.S.C. (Biology Group). Candidates desirous of taking admission on the basis of degrees/certificates other than University of Karachi should get the equivalence of their degrees/certificates determined by the University Equivalence Committee well before the scheduled date of admissions. Candidates passing 'O' Level, 'A' Level or other foreign degrees/certificates should get the equivalence of their grades and marks determined before the scheduled date.

2. Examinations
System of Examination and Grading

i. Terminal Examination
The examination held at the end of semester after the completion of a course is known as Terminal Examination. It will carry 100 marks. This examination's passing head, i.e., a student must obtain a minimum of 50 marks for each course in this examination.

ii. Grading System
Grades given to a student in each course is of two types:

a. Numerical Grade (NG)
Assessment of performance on the basis of marks out of 100 fixed for a course of 3 or 2 credit hours unit is NG.

b. Alphabetical Grade (AG)
Equivalent of numerical grades in terms of alphabets shall be termed as alphabetical grades. (Each letter carries a value in terms of numerical points).

c. Grading

Marks (NG)	Grade (AG)	Grade Point
90 & above	A+	4.0
85-89	A	4.0
80-84	A-	3.8
75-79	B+	3.4
71-74	B	3.0
68-70	B-	2.8
64-67	C+	2.4
61-63	C	2.0
57-60	C-	1.8
53-56	D+	1.4
50-52	D	1.0
Below 50	Fails	0.0

d. Incomplete Grade
For incomplete courses no point shall be given.

e. Grade Point Ratio (GPR)
Points obtained in each course shall be multiplied by the number of credit hours specified for that course, and then a grade point ratio (GPR) shall be calculated.

Formula

Grade points in a Course= Credit hours of the course X Grade point equivalent to the score given in the grade point table

f. Cumulative Grade Point Ratio (CGPR)

This is obtained by adding all the Grade Points of the courses during 5 years study period and dividing the total by the total number of credit hours.

$$\text{CGPR} = \frac{\text{Total Grade Points in all the courses}}{\text{Total number of Cr. Hrs.}}$$

Course Schedule

Pharm. D. Program
First Professional

Course No.	Course Title (First Semester)	Cr. Hours
* PHT-301	Pharmaceutics - Fundamental of Pharmacy	3
** PHC-303	Pharmaceutical Chemistry - Organic	3
*** PHL-305	Pharmacology - Islamic learning/Pak Studies	2
PHL-307	Pharmacology - Physiology & Histology - I	3
PHL-309	Pharmacology - Biochemistry - I	3
PHL-311	Pharmacology - Biochemistry (Practical)	3
PHC-313	Pharmaceutical Mathematics	3
Total Courses 7		Cr. Hrs. 20

Course No.	Course Title (Second Semester)	Cr. Hours
PHT-302	Pharmaceutics - Pharmaceutical Dosage Forms - I	3
PHC-304	Pharmaceutical Chemistry - Organic/Inorganic (Practical)	3
PHC-306	Pharmaceutical Statistics	3
PHL-308	Pharmacology - Physiology & Histology - II	3
PHL-310	Pharmacology - Biochemistry - II	3
**** PHG-312	Pharmacognosy - General Pharmacognosy	3
PHL-314	Pharmacology - Anatomy	2
	English - Compulsory - (Non-credit course)^	
Total Courses 7		Cr. Hrs. 20

^ Passing English is Compulsory

*	**PHT**	**Pharmaceutics**
**	**PHC**	**Pharmaceutical Chemistry**
***	**PHL**	**Pharmacology**
****	**PHG**	**Pharmacognosy**

Course Schedule

Pharm. D. Program
Second Professional

Course No.	Course Title (First Semester)	Cr. Hours
PHT-401	Pharmaceutics-Pharmaceutical Dosage Forms-II	3
PHT-403	Pharmaceutics- Microbiology- I	3
PHC-405	Pharmaceutical Chemistry-Physical-I	3
PHL-407	Pharmacology- Physiology & Histology (Practical)	3
PHL-409	Pharmacology-Pharmacology & Therapeutics	3
PHG-411	Pharmacognosy– Herbal Quality Control Lab-I (Practical)	3
PHL-413	Pharmacology-Pathology	2
Total Courses 7		Cr. Hrs. 20

Course No.	Course Title (Second Semester)	Cr. Hours
PHT-402	Pharmaceutics-Pharmaceutical Dosage Forms (Lab)	3
PHT-404	Pharmaceutics-Microbiology-II	3
PHC-406	Pharmaceutical Chemistry-Physical-I (Practical)	2
PHC-408	Pharmaceutical Chemistry- Physical-II	3
PHL-410	Pharmacology-Systemic Pharmacology - I	3
PHG-412	Pharmacognosy-Chemical Pharmacognosy-I	3
PHT-414	Pharmaceutics-Physical Pharmacy	3
Total Courses 7		Cr. Hrs. 20

Course Schedule

Pharm. D. Program
Third Professional

Course No.	Course Title (First Semester)	Cr. Hours
PHT- 501	Pharmaceutics – Pharmaceutical Microbiology (Lab.)	3
PHC- 503	Pharmaceutical Chemistry- Physical-II (Practical)	3
PHC- 505	Pharmaceutical Chemistry- Quality Control	3
PHL- 507	Pharmacology- Systemic Pharmacology - II	3
PHL- 509	Pharmacology - Pathology (Practical)	2
PHG - 511	Pharmacognosy - Chemical Pharmacognosy- II	3
PHT- 513	Pharmaceutics - Computer Application in Pharmacy	2
Total Courses 7		Cr. Hrs. 19

Course No.	Course Title (Second Semester)	Cr. Hours
PHT- 502	Pharmaceutics - Physical Pharmacy (Lab)	3
PHT- 504	Pharmaceutics - Industrial Pharmacy- I (Unit Operations)	3
PHC- 506	Pharmaceutical Chemistry- Prep/Q.C. (Practical)	3
PHC- 508	Pharmaceutical Chemistry- Pharmaceutical Analysis- I	3
PHL - 510	Pharmacology- Pharmacology (Practical)	3
PHG - 512	Pharmacognosy- Herbal Quality Control Lab -II (Practical)	3
PHG-514	Pharmacognosy - Natural Toxins	2
Total Courses 7		Cr. Hrs. 20

Course Schedule

Pharm. D. Program
Fourth Professional

Course No.	Course Title (First Semester)	Cr. Hours
***** PHP- 601	Pharmacy Practice - I	3
PHT- 603	Pharmaceutics - Industrial Pharmacy - II - Pharmaceutical Engineering	3
PHT - 605	Pharmaceutics - Industrial Pharmacy (Lab)	3
PHC- 607	Pharma. Chemistry- Pharmaceutical Analysis- I (Practical)	3
PHL - 609	Pharmacology- Systemic Pharmacology - III	3
PHG - 611	Pharmacognosy - Advance Pharmacognosy	3
PHT- 613	Pharmaceutics- Pharmaceutical Technology	3
Total Courses 7		Cr. Hrs. 21

Course No.	Course Title (Second Semester)	Cr. Hours
PHP- 602	Pharmacy Practice-II	3
PHT - 604	Pharmaceutics – Biopharmaceutics and Pharmacokinetics (I)	3
PHT - 606	Pharmaceutics - Clinical Pharmacokinetics	3
PHC- 608	Pharmaceutical Chemistry - Pharmaceutical Analysis-II	3
PHC- 610	Pharmaceutical Chemistry- Medicinal- I	3
PHL - 612	Pharmacology - Pharmacology Lab-II	3
PHT - 614	Pharmaceutics - Pharmaceutical Technology (Lab)	3
Total Courses 7		Cr. Hrs. 21

***** **PHP** **Pharmacy Practice**

Course Schedule

Pharm. D. Program
Fifth Professional

Course No.	Course Title (First Semester)	Cr. Hours
PHT - 701	Pharmaceutics - Biopharmaceutics & Pharmacokinetics (Lab)	3
PHT - 703	Pharmaceutics - Forensic Pharmacy	3
PHP- 705	Pharmacy Practice – III	3
PHC- 707	Pharmaceutical Chemistry- Pharmaceutical Analysis- II (Practical)	3
PHC- 709	Pharmaceutical Chemistry- Medicinal- II	3
PHL - 711	Pharmacology - Clinical Pharmacology	2
PHG - 713	Pharmacognosy - Clinical Pharmacognosy	2
Total Courses 7		Cr. Hrs. 19

Course No.	Course Title (Second Semester)	Cr. Hours
PHT- 702	Pharmaceutics - Prescription & Community Pharmacy	3
PHT- 704	Pharmaceutics - Pharma. Management & Marketing	3
PHT- 706	Pharmaceutics - Prescription Pharmacy (Lab)	3
PHT- 708	Pharmaceutics - Pharmaceutical Quality Management	3
PHC- 710	Pharmaceutical Chemistry - Medicinal- III	3
PHL- 712	Pharmacology – Toxicology	2
PHP- 714	Pharmacy Practice – IV	3
Total Courses 7		Cr. Hrs. 20

Total Courses = 70 **Total Credit Hours = 200**

Course Schedule

Pharm. D. (Deficiency) Program

First Semester

Course No.	Course Title (First Semester)	Cr. Hours
PHC- 303 (D)	Pharmaceutical Chemistry (Organic and Inorganic)	2
PHC- 505 (D)	Theoretical Basis of Quality Control	2
PHT- 513 (D)	Computer Application in Pharmacy	2
PHT- 613 (D)	Pharmaceutical Technology	2
PHC- 707 (D)	Pharmaceutical Analysis	2
PHL - 711 (D)	Clinical Pharmacology	2
PHG- 713 (D)	Clinical Pharmacognosy	2
PHL - 715 (D)	Anatomy	2
PHL - 721 (D)	Pathology (Theory & Practical)	3
Total Courses 9		Cr. Hrs. 19

Second Semester

Course No.	Course Title (First Semester)	Cr. Hours
PHC- 406 (D)	Physical Chemistry (Lab.)	2
PHG- 514 (D)	Natural Toxicants	2
PHT- 606 (D)	Clinical Pharmacokinetics	3
PHT- 614 (D)	Pharmaceutical Technology (Practical)	3
PHT- 702 (D)	Clinical Pharmacy	3
PHT- 708 (D)	Pharmaceutical Quality Control and Assurance	2
PHC- 710 (D)	Medicinal Chemistry	3
PHL - 712 (D)	Toxicology	2
PHL - 718 (D)	Physiology, Histology and Biochemistry (Practical)	3
Total Courses 9		Cr. Hrs. 23

Total Courses = 18 **Total Credit Hours = 43**

Faculty of **Pharmacy and Pharmaceutical Sciences**

Department of Pharmaceutics

Message from the Chairman

The word "Pharmaceutics" in Pharmacy and Pharmaceutical Sciences is used to cover many subject areas related to the steps to which a drug is converted into a medicine. It starts with the discovery or synthesis of a drug, followed by its isolation, purification, testing for pharmacological benefits, and ensuring the absence of serious toxicological issues. In simple words, Pharmaceutics is the science of dosage form design.

Today, Pharmaceutics is transitioning from conventional dosage forms, such as tablets, capsules, and injectables, to modern drug delivery systems such as nanotechnology and targeted drug delivery system. We are now formulating drugs using a more systematic approach, such as Quality by Design (QbD), which reduces product recalls and ensures the continuous availability of drugs in the market. Additionally, there is an increased focus on meeting individual patient needs through personalized medicine (patient-centered) and advanced analytics using Artificial Intelligence (AI) and machine learning (ML).

The Department of Pharmaceutics at Karachi University offers a high-quality curriculum that incorporates the latest advancements in pharmaceutical sciences. The curriculum is delivered in a student-centered environment designed to foster higher-level cognitive learning. The department is home to 13 dedicated faculty members, most of them hold doctoral degrees and are actively engaged in both teaching and research. The department provides well-maintained classrooms equipped with teaching aids, as well as laboratories that offer hands-on, practical learning experiences to complement theoretical knowledge and research.

Students admitted to the Faculty of Pharmacy at Karachi University are fortunate to learn from recognized experts in pharmaceutical sciences, who are highly regarded in the pharmacy profession. These experts prepare students to become the leaders of tomorrow, equipped with the knowledge and skills needed to make significant contributions to the pharmaceutical field.

Together, let us work towards building a healthier society.

Prof. Dr. Syed Muhammad Farid Hasan

Department of **Pharmaceutics**

Pharmaceutics is one of the major departments of Faculty of Pharmacy & Pharmaceutical Sciences, University of Karachi, holding about one third of the total pharmacy curricula, indicating the length of areas covered in the field of pharmaceutics for this reason, in some countries pharmaceutics refers to as pharmacy itself.

The term pharmaceutics is about science that involves "converting a drug into a medicine". It starts right after the drug discovery from the natural sources, passing through its physical and chemical characterization, manufacturing, formulation development and optimization, quality assessment and control, its marketing aspects till its use by the patients.

Department of Pharmaceutics, Faculty of Pharmacy & Pharmaceutical Sciences, University of Karachi, comprises of 13 academic and 13 non-academic staff, including five Professors, one Associate Professor, two Assistant Professors, three Assistant Professors (T) and two lectures. The department covers 22 courses spanned over five years of Pharm. D program. The department is actively involved in pharmaceutical research that covers all aspects of pharmaceutical sciences offering M.Pharm., M.Phil., and Ph.D. degrees. To date, the department has produced over 188 M.Pharm., 105 M.Phil. and 98 Ph.D. and M.Phil./ Ph.D. graduates in different disciplines of pharmaceutics.

Contact Details

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Vision and Mission Statement

• Vision

The Department of Pharmaceutics envisions a high quality, innovative, cost-effective and equitable pharmaceutical and healthcare industry by becoming a dependable source of 'high-quality skilled professionals' and 'research-based solutions' to various challenges in the industry.

• Mission

Pharmacists are essential partners to the health care providing team and play a distinguished role in providing healthier and better lives.

In contrast to different Pharm D programs offered by various schools of pharmacy, the Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, is contributing in the human resource across the globe since 1974. The department has designed the courses of Pharmaceutics to bring excellence in pharmacy education and betterment in community service. The courses are specially designed to fulfill the requirements of pharmaceutical manufacturing sector and to provide optimal patient care. The objective is to produce a proficient pharmacist in medication management with distinct leadership skills and ability to demonstrate and effectively communicate with other related professionals. The graduate must have sufficient knowledge to meet the everyday rising demand of pharmaceutical manufacturers especially in the field of product development. The Pharm D program is accredited by the Pakistan Pharmacy Council, making pharmacy graduates eligible for regional and international licensure.

Group Photo of the Department

Sitting, from L to R: Ms. Rehana Saeed, Prof. Dr. Rabia Ismail Yousuf, Prof. Dr. S. M. Farid Hassan (Chairperson), Prof. Dr. Muhammad Harris Shoaib (Dean) and Prof. Dr. Iyad Naeem Muhammad.

Standing, from L to R: Dr. Farrukh Rafiq Ahmed, Dr. Faaiza Qazi, Dr. Sadaf Farooqi, Dr. Tazeen Husain and Dr. Kamran Ahmed

Dr. Muhammad Harris Shoaib

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2000**
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Dr Harris is the Dean, Faculty of Pharmacy and Pharmaceutical Science. He is also the Professor and Ex Chairman of the Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, University of Karachi. He has done his BPharm. (1994), M.Phil. (1998) and Ph.D. (2004) from the University of Karachi. More than 25 years of teaching and research experience in various academic positions. Supervised more than 35 Ph.D., 40 M.Phil. and 20 M.Pharm. students. Published around 200 research publications in impact factor journals with an overall citation of 2600 and an impact factor of 230 (h-index 23 and i10 index 40). Invited reviewer for many international journals. Member Board of Studies and Board of Faculty not only in this University but in various other Universities of Karachi. Awarded Productive Scientist of Pakistan from Pakistan Council for Science and Technology. Already won two NRPU projects and one SRSP project. He is also the elected member of the Syndicate, the Academic Council, and the Senate. He was also the member of the member Pharmacy Council of Pakistan from 2006-2012.His area of expertise is in Pharmaceutics, Drug Delivery System, Biopharmaceutics and Pharmacokinetics, Pharmaceutical Microbiology, and Pharmacy Practice.

Dr. Syed Muhammad Farid Hasan

Designation: **Chairman and Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
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Phone: **(+92-21) 99261300-7 Ext. 2252**

Dr. Syed Muhammad Farid Hasan has received B.Pharm., M.Phil. and Ph.D. degrees from the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. He has a rich experience of more than two decades of serving in pharmaceutical industries and academia (administration, teaching and research). He also served in College of Pharmacy, Almaarefa University, Riyadh, Kingdom of Saudi Arabia. His areas of interest are; Formulation and Product Development, Novel drug delivery system, Solubility enhancement of poorly soluble drugs, Biopharmaceutics and Pharmacokinetics, Bioequivalence etc.

Dr. Rabia Ismail Yousuf

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
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Dr. Rabia Ismail Yousuf received her BPharm degree in year 2001, M.Phil. (Pharmaceutics) in 2005, and received her Ph.D. degree (Pharmaceutics) in year 2009 from University of Karachi. She joined Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in year 2006. She is serving as associate professor since 2016. She is a member of board of studies and board of faculty of different colleges of Pharmacy. She has won multiple research grants from the Higher Education Commission (HEC) and Sindh Higher Education Commission (SHEC). There are around 2000 citations of her 130 research article. She bears h-index 19 and i10-index 43. She has 15 M.Phil. and Ph.D. students on her credit so far. She served also as faculty student advisor from 2011-2017.

Her research areas include designing drug delivery system (Hydrodynamically controlled gastroretentive system, osmotically controlled system, transdermal system, Oro-disintegrating/dissolving system, etc.), immediate release and controlled release formulations design (tablets, transdermal patches, microneedles, pellets, mini-tablets etc.) and optimization by Quality by Design (QbD), in silico application as predictive tool for formulation performance and physiologically based pharmacokinetic (PBPK) modelling and real-time Bioavailability and Bioequivalence (BA/BE) studies.

Dr. Iyad Naeem Muhammad

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
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Dr. Iyad Naeem joined the Faculty of Pharmacy in 2006, after over five years' experience as a hospital pharmacist. He holds a Ph.D. in Pharmaceutics from University of Karachi, specializing in formulation development, optimization, and population pharmacokinetics, along with an M.Phil. focusing on antimicrobial resistance and nosocomial infections. Currently he is Professor, teaching undergraduate and postgraduate courses in Dosage Forms, Pharmaceutical Quality Control, Forensic Pharmacy, and Hospital Pharmacy. His research interests include Pharmaceutical Microbiology, Formulation Development, and Pharmacy Practice, and he has supervised numerous graduate students in related fields.

Dr. Rabia Bushra

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2025**
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Dr. Rabia Bushra has recently joined the Faculty of Pharmacy and Pharmaceutical Sciences as Professor. She is an experienced academician with a strong research background in Pharmaceutics, committed to bridging theory and practice through innovative teaching and translational research. She has a keen interest in formulation sciences, biowaiver studies, Stability testing, In vitro drug release kinetics and Pharmacokinetics. She is an active member of academic boards and faculties across various pharmacy institutions, contributing to policy development, curriculum design and educational excellence.

Dr. Farya Zafar

Designation: **Associate Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2016**
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Dr. Farya Zafar received her B.Pharm. degree from Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in 2001, an M.Phil. degree and Ph.D. degree in Pharmaceutics from Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in 2006 and 2013 respectively. Her area of interest is in Formulation Development, Pharmacokinetics and Bio-Pharmaceutics. Her research expertise is in Pharmaceutical Technology, Formulation designing and development of drug delivery system.

Dr. Sabahat Jabeen

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
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Dr. Sabahat Jabeen is currently serving as an Assistant Professor in the Department of Pharmaceutics. She received her B.Pharm. degree from the University of Karachi in 1991. In 2003, she completed her M.Phil. followed by Ph.D. in Pharmaceutics in 2018 from the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. Her academic and research interests are primarily centered around Physical Pharmacy, as well as the formulation development and optimization of pharmaceutical products.

Ms. Rehana Saeed

Designation: **Assistant Professor**
Qualification: **PM.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
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Ms. Rehana Saeed received her B.Pharm. degree from Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in 1993, an M.Phil. degree in Pharmaceutics from Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in 2001. Her area of interest is in Pharmaceutical Microbiology, Pharmacokinetics, Formulation Development, Hospital Pharmacy and Clinical Pharmacy.

Dr. Faaiza Qazi

Designation: **Assistant Professor (T)**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2016**
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Faaiza Qazi received her Pharmacy degree with gold medals as secured first position from the University of Karachi, a M.Phil. degree in Pharmaceutics from the University of Karachi, and a PhD in development and optimization of extended-release pellets and their pharmacokinetics from University of Karachi. Her research and teaching focus on the designing and optimization of novel drug delivery systems and determining their pharmacokinetics. She is the principal investigator for the controlled/sustained release formulations development and optimization team in the Department of Pharmaceutics at the University of Karachi, where her laboratory focuses on designing and optimizing a variety of novel drug delivery systems like pellets, nanoparticles, gummies, minitablets, osmotic pump tablets etc.

Dr. Farrukh Rafiq Ahmed

Designation: **Assistant Professor (T)**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2016**
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Dr. Farrukh Rafiq Ahmed is a pharmaceutical scientist and educator with extensive expertise in formulation science and pharmacokinetics. Currently serving as an Assistant Professor in the Department of Pharmaceutics at the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, Dr. Ahmed has more than one and a half decades of experience in research, teaching, and mentoring.

His research focuses on innovative drug delivery systems, including amorphous solid dispersions, intranasal powder-based formulations, and transdermal drug delivery. He has contributed significantly to pharmaceutical science through over 40 research publications in reputable SCI-indexed journals, three book chapters, and various high-impact research projects.

He is a seasoned trainer in Quality by Design (QbD) approach for formulation development, a sitting member of the Pakistan Pharmacists Association-Sindh and HEC national curriculum committee, and an organizer of 'Career Summits and Fairs' since 2019, nurturing hundreds of young professionals for various specializations in pharma sectors. Moreover, Dr Ahmed is also serving as an associate editor of the international journal 'Biointegration' beside serving on the editorial advisory board of the 'Pakistan Journal of Pharmaceutical Sciences'.

Dr. Ahmed's work exemplifies a commitment to advancing pharmaceutical education and research, ensuring his contributions resonate in both academic and professional domains.

Dr. Kamran Ahmed

Designation: **Assistant Professor (T)**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2016**
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Dr. Kamran Ahmed received his Ph.D. and M.Phil. degree from Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. He received his B.Pharm. degree from Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi with 1st class 3rd position. His teaching focus on Pharmaceutics subjects including design of dosage forms, Physical Pharmacy, Industrial Pharmacy, Dispensing Pharmacy. He is the principal Investigator for the osmotic drug delivery system design team and was the among the initial investigators in Pakistan who researched on oral osmotic drug delivery systems and published manuscripts in worldwide reputable journals. Several postgraduate (M.Phil. & Ph.D.) students are working under supervision. His Area of research expertise is Design and Evaluation of Controlled Drug Delivery Systems like Osmotic pumps, Bilayer tablets, Matrix tablets etc. He is currently also Faculty student advisor.

Dr. Sadaf Farooqi

Designation: **Lecturer**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2016**
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Dr. Sadaf Farooqi B.Pharm., M.Phil., Ph. D, RPh is a lecturer in the Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. She earned her Bachelor of Pharmacy (B.Pharm.) degree from the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, in 2001. She completed her M.Phil. in Pharmaceutics in 2012 from the same institution and was awarded her Ph.D. in Pharmaceutics in 2024 from the Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi.

Her research interests encompass novel drug delivery systems, in silico modeling for formulation development, Pharmaceutical Microbiology and innovative strategies to help advance the quality of Pharmacy education and public health.

Dr. Tazeen Husain

Designation: **Lecturer**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2016**
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Dr. Tazeen Husain received her Pharm D degree from the University of Karachi, where she also completed her M.Phil. and Ph.D. in the Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences. She specializes in both conventional and novel formulation development. Beyond pharmaceutical formulation development and characterization, her areas of interest include social pharmacy, pharmacoepidemiology, pharmacy pedagogy, pharmaceutical microbiology, antimicrobial use, and antimicrobial resistance. Her research emphasizes the One Health approach and incorporates the Sustainable Development Goals.

Board of Studies

Prof. Dr. Muhammad Harris Shoaib
Dean,
Faculty of Pharmacy and Pharmaceutical Sciences,
University of Karachi, Karachi

Prof. Dr. S. M. Farid Hasan
Professor and Chairman
Department of Pharmaceutics
University of Karachi, Karachi

Prof. Dr. Rabia Ismail Yousuf
Professor
Department of Pharmaceutics
University of Karachi, Karachi

Prof. Dr. Iyad Naeem Muhammad
Professor
Department of Pharmaceutics
University of Karachi, Karachi

Prof. Dr. Rabia Bushra
Professor
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Dr. Farya Zafar
Associate Professor
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Dr. Sabahat Jabeen
Assistant Professor
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Dr. Sadaf Farooqi
Lecture
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Dr. Syed Jamshaid Ali Kazmi
Vice Chancellor
Sohail University, Karachi

Prof. Dr. Abdullah Dayo
Dean, Faculty of Pharmacy,
University of Sindh, Jamshoro.

Dr. Anwar Ejaz Beg
Professor of Pharmaceutics and Advisor to Chancellor,
Faculty of Pharmacy, Ziauddin University, Karachi.

Dr. Zafar Alam Mehmood
Country Manager,
Colorcon (Pvt) Ltd, Karachi.

Pharm. D. Courses

First Professional					
1st Semester			2nd Semester		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHT- 301	Pharmaceutics - Fundamental of Pharmacy	3	PHT- 302	Pharmaceutics - Pharmaceutical Dosage Forms – I	3
Second Professional					
PHT- 401	Pharmaceutics - Pharmaceutical Dosage Forms – II	3	PHT- 402	Pharmaceutics - Pharmaceutical Dosage Forms (Lab)	3
PHT- 403	Pharmaceutics - Microbiology – I	3	PHT- 404	Pharmaceutics - Microbiology – II	3
-	-	-	PHT- 414	Pharmaceutics - Physical Pharmacy	3
Third Professional					
PHT- 501	Pharmaceutics – Pharmaceutical Microbiology (Lab)	3	PHT- 502	Pharmaceutics - Physical Pharmacy (Lab)	3
PHT- 513	Pharmaceutics - Computer Application in Pharmacy	2	PHT- 504	Pharmaceutics - Industrial Pharmacy - I (Unit Operations)	3
Fourth Professional					
PHT- 603	Pharmaceutics - Industrial Pharmacy - II- Pharmaceutical Engineering	3	PHT- 604	Pharmaceutics - Biopharmaceutics and Pharmacokinetics (I)	3
PHT- 605	Pharmaceutics - Industrial Pharmacy (Lab)	3	PHT- 606	Pharmaceutics - Clinical Pharmacokinetics	3
PHT- 613	Pharmaceutics - Pharmaceutical Technology	3	PHT- 614	Pharmaceutics - Pharmaceutical Technology (Lab)	3
Fifth Professional					
PHT- 701	Pharmaceutics - Bio-Pharmaceutics and Pharmacokinetics (Lab)	3	PHT- 702	Pharmaceutics - Prescription and Community Pharmacy	3
PHT- 703	Forensic Pharmacy	3	PHT- 704	Pharmaceutics - Pharmaceutical Management and Marketing	3
-	-	-	PHT- 706	Pharmaceutics - Prescription Pharmacy (Lab)	3
-	-	-	PHT- 708	Pharmaceutics - Pharmaceutical Quality Management	3
Total **22** Courses making **68** Credit Hours in five years					

Pharm. D. Courses – Outline
First Semester

Pharmaceutics - Fundamental of Pharmacy

PHT-301
Cr. Hrs. 3

1. **Pharmacy Orientation**
   Introduction and orientation to the profession of pharmacy in relation to hospital pharmacy, retail pharmacy, industrial pharmacy, forensic pharmacy, pharmaceutical education and research etc.

2. **History of Pharmacy**
   A survey of the history of pharmacy through ancient, Greek and Arab periods with special reference to contribution of Muslim scientists to pharmacy and allied sciences. Introduction to literature of pharmacy.

3. **Literature of Pharmacy**
   Pharmacopocia, formularies, codices, abstracts, etc.

4. **Physico-chemical Process**
   Precipitation, crystallization, evaporation, distillation, efflorescence deliquescence, lyophillization, elutrition, exication, descication, ignition, fusion, sublimation, calcination, decantation, adsorption, centrifugation, tirturation, levigation, dialysis, extraction, (maceration, percolation, infusion, decoction, digestion)

Books Recommended

1. Martin, P., Bustamante, P., & Chun, A. H. C. (1999). *Physical and chemical principles of pharmaceutical science* (4th ed.). New York Publisher.
2. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage form design* (2nd ed.). Harcourt Publishers.
3. Rawlins, E. A. (Ed.). (1977). *Bentley's textbook of pharmaceutics* (8th ed.). Macmillan Publishing Co. Inc.
4. Banker, G. S., & Rhodes, C. T. (2002). *Modern pharmaceutics* (4th ed., rev. and expanded). Marcel Dekker, Inc.
5. Carstensen, J. T., & Rhodes, C. T. (Eds.). (2000). *Drug stability: Principles and practices* (3rd ed., rev. and expanded). Marcel Dekker, Inc

Pharmaceutics - Pharmaceutical Dosage Forms - II

PHT-401
Cr. Hrs. 3

1. **Non – Galenicals – Solid Dosage Forms**
   i. Powders: Definition, properties, advantages, disadvantages, types and preparation etc.
   ii. Tablets: Definition, types, essentials, advantages, disadvantages, formulation, manufacture, evaluation etc.
   iii. Capsules: Definition, advantages, disadvantages, types etc.
   iv. Miscellaneous: Suppositories, surgical dressings, glycerogelatins, medicated pencils, cements etc.

2. **Non-Galenical – Semi-solid Dosage Forms**
   i. Ointment: Definition, ointment bases, preparation, dispensing etc.
   ii. Miscellaneous: Creams, pastes, poultices, plasters etc.

3. **New Dosage Forms**
   Introduction of new dosage forms, drug delivery system and cosmetology.

Books Recommended

1. Hellery, A. M., Lloyd, A. W., & Swarbrick, J. (2001). *Drug delivery and targeting: For pharmacists and pharmaceutical scientists*. Taylor & Francis Publications.

2. Robinson, J. R. (1997). *Controlled drug delivery.* Marcel Dekker Publications.
3. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage forms design* (2nd ed.). Harcourt Publications.
4. Banker, G. S., & Rhodes, C. T. (2002). *Modern pharmaceutics* (4th ed.). Marcel Dekker Publishing.
5. Allen, L. V., Jr., & Ansel, H. C. (2014). *Ansel's pharmaceutical dosage forms and drug delivery systems* (10th ed.). Lippincott Williams & Wilkins.

Pharmaceutics - Microbiology - I

PHT-403
Cr. Hrs. 3

1. **General Microbiology**
   Historical introduction, scope of microbiology with special reference to pharmaceutical sciences. Nomenclature in classification of micro-organisms including virus, rickettsia, bacteria, fungi and protozoa.

2. **Bacteria**
   Classification of bacteria, cell structure, morphology and functions, growth factors, growth characteristics and growth curve, nutritional requirement and nutritional factors effecting growth, Different type of media and staining procedures.

3. **Immunology**
   Definitions, classifications and cellular basis of immune response, immunity, auto-immunity and tolerance. Antigen, antibody, antigen antibody reactions and their clinical and diagnostic applications. Hypersensitivity and allergy and drug allergy mechanisms. Graft reaction, autoimmune disease.

4. **Infections**
   Study of infections caused by following bacterial genera:
   Staphylococcus, Streptococcus, Salmonella, Cholera, Mycobacterium, Helicobacter.
   Various viral and rickettsial infections including rabbies, hepititus, AIDS and other emerging patogens. Rickettsial infections including leishmania and protozoal infections including malaria and others. Normal flora of human body.

5. **Microbiology of Air, Water and Soil.**

Books Recommended

1. Pommerville, J. C. (2010). *Alcamo's fundamentals of microbiology* (9th ed.). Jones & Bartlett Publications.
2. Jawetz, E., Melnick, J. L., & Adelberg, E. A. (2012). *Jawetz, Melnick & Adelberg's medical microbiology* (26th ed.). McGraw-Hill Lange Publications.
3. Greenwood, D., Barer, M., Slack, R., & Irving, W. (2012). *Medical microbiology: A guide to microbial infections* (18th ed.). Churchill Livingstone.
4. Tortora, G. J., Funke, B. R., & Case, C. L. (2015). *Microbiology: An introduction* (12th ed.). Pearson Education.

Pharmaceutical Microbiology (Lab)

PHT-501
Cr. Hrs. 3

1. **Introduction to the pharmaceutical microbiology la**
   a. Orientation
   b. Tools of the lab
   c. Equipment and apparatus
   d. Microbiological culture media

2. **Fundamental techniques used in the lab**
   a. Microscopy
   b. Simple staining
   c. Gram staining
   d. Capsule staining
   e. Microbiological culture media preparation and sterilization

f. Aseptic isolation and inoculation techniques

3. **Biochemical tests for the identification of microorganisms**
   a. Catalase test
   b. Coagulase test

4. **Studying microbial growth**
   a. Culture characteristics of bacteria
   b. Studying the bacterial growth curve
   c. Effect of temperature, pH and osmotic pressure on microbial growth

5. **Control of microorganisms using physical and chemical methods**
   a. Sterilization using heat
   b. Sterilization using ultraviolet radiation
   c. Studying the effectiveness of different antiseptics and disinfectants
   d. Kirby Bauer antibiotic disc diffusion assay
   e. The Sterility test

6. **Microbes around us**
   a. Environmental sampling: using settle plate method to determine bioburden in the air
   b. Environmental sampling: qualitative and quantitative analysis of water
   c. Human microbiome

7. **Clinically important bacteria: studying the morphology, culture characteristics, clinical significance of selected bacteria**

Books Recommended

1. Pommerville, J. C. (2010). Alcamo's fundamentals of microbiology (9th ed.). Jones & Bartlett Publishers..
2. Tortora, G. J. (2018). Microbiology: An introduction (12th ed.). The Benjamin/Cummings Publishing Company, Inc.
3. Denyer, S. P., Hodges, N. A., & Gorman, S. P. (2004). Hugo and Russell's pharmaceutical microbiology (7th ed.). Blackwell Science..
4. Hanlon, G., & Hodges, N. A. (2012). Essential microbiology for pharmacy and pharmaceutical science. Wiley.
5. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (2006). Microbiology (5th ed.).

Pharmaceutics - Computer Application in Pharmacy

PHT-513
Cr. Hrs. 2

1. **Introduction** to Microsoft Windows and its different packages like MS Word, Excel, PowerPoint and Access.

2. **Internet and Email**
   Internet and Microsoft internet explorer 5, searching the internet, e-mail and news group, favorites, security and customizing explorer.

3. **Web Page Development**
   Introduction to front page, creating a first web site, basic formatting technique, manipulating tables within front page, FrontPage, pictures and multimedia, hyperlinking, bookmarks and image maps, front page and frames, managing your web, good site design.

4. **Complete Statistical Packages,** Statistica®

5. **Languages** at least two prevailing languages will be taught.

Books Recommended

1. Lambert, J., & Frye, C. (2022). *Microsoft Office step by step (Office 2021 and Microsoft 365)* (1st ed.). Microsoft Press.
2. Lambert, J. (2022). *Microsoft Excel step by step (Office 2021 and Microsoft 365).* (1st ed.). Microsoft Press.
3. Gralla, P. (2006). *How the internet works* (8th ed.). Que Publishing.

4. Robbins, J. N. (2018). *Learning web design: A beginner's guide to HTML, CSS, JavaScript, and web graphics* (5th ed.). O'Reilly Media.
5. Columbus, L. (2008). *The MS-Windows XP Professional Handbook* (1st ed.). Laxmi Publications Pvt Limited.
6. TIBCO Software Inc. (2024). *TIBCO Statistica: User's guide*. TIBCO Software. https://docs.tibco.com
7. TIBCO Software Inc. (2024). *Electronic statistics textbook*. TIBCO Software. https://www.statsoft.com/textbook/
8. Herrera, C., & Hajek, D. W. (2023). *Introduction to Computers* (2023 ed.) Independently Published.

Pharmaceutics - Industrial Pharmacy - II Pharmaceutical Engineering

PHT-603
Cr. Hrs. 3

1. Pharmaceutical Facility Design: General Architectural Design Issues: ISPE Hygienic Zones and Design details
2. Material finishes of Pharmaceutical Manufacturing Areas
3. Facility Utility Systems:
4. Oral Solid Dosage Facilities: Design, Architectural Considerations, HVAC Design Considerations and Utility requirements.
5. Sterile Manufacturing Facilities: Design and Architecture, Material and Personnel Flow, Room Layout and Facility Configuration.
6. Packaging and Warehousing Facilities: Layout, System and Utility requirements.
7. Pressure vessels, reactors and fermenters
8. Reliability, Availability, and Maintainability
9. Commissioning, qualification and validation
10. Occupational Health and Safety

Books Recommended

1. Schlindwein, W. S., & Gibson, M. (2018). Pharmaceutical quality by design: A practical approach (1st ed.). Advances in Pharmaceutical Technology.
2. Hickey, A. J., & Ganderton, D. (Eds.). (2016). Pharmaceutical process engineering (2nd ed.).
3. Jacobs, T., & Signore, A. A. (2016). Good design practices for GMP pharmaceutical facilities (2nd ed.). Drugs and the Pharmaceutical Sciences.
4. Cole, G. (2007). Pharmaceutical production facilities: Design and applications (2nd ed.). Pharmaceutical Science Series.
5. Hickey, A. J., & Ganderton, D. (Eds.). (2010). Pharmaceutical process engineering (2nd ed.). Informa Healthcare.

Pharmaceutics - Industrial Pharmacy (Lab)

PHT-605
Cr. Hrs. 3

1. **Manufacture of Tablets by**
   Wet granulation method, manufacture of tablets by slugging, manufacture of tablets by direct compression method.

2. **Coating of Tablets**
   Sugar coating, film coating, enteric coating.

3. **Clarification of Liquids by Various Processes**
   Size reduction, homogenization. Ampoule filling, sealing and sterilization clarity and leakage tests in injectable. Capsule filling by semi-automatic machines.

4. **Manufacture of Sustained Action Drugs**

5. **Tablets Tests**
   Disintegration, dissolution, friability, hardness and thickness tests. Determination of weight variation in tablets. Density of powder. Particle size analysis.

6. **Content Uniformity Test**
   Using HPLC technique, relative humidity and moisture content determination.

Books Recommended

1. Aulton, M. E. (2002). Pharmaceutics: The science of dosage form design (2nd ed.). Harcourt Publishers.
2. Banker, G. S., & Rhodes, C. T. (2002). Modern pharmaceutics (4th ed., rev. and expanded). Marcel Dekker, Inc.

Pharmaceutics - Pharmaceutical Technology

PHT-613
Cr. Hrs. 3

1. **Barriers to Drug Delivery Systems (DDS)**
   a. Oral, IV, IM, Rectal, Pulmonary DDS
   b. Reticulo-endothelial system

2. **Principles of Non-Targeting/Conventional Pharmaceutical Formulations and Dosage Form Design**
   a. Need, product formulation and preformulation studies
   b. Formulation development of Aerosols, Opthalmic and Parentral Preparations
   c. Formulation development of Osmotic, Sustained-Release, Rapidly Disintegrating, Gastro-retentive drug delivery systems.

3. **Concept of Targeting DDS**
   a. Active vs. Passive Targeting
   b. Targeting Strategies
      i. Environment and stimuli sensitive targeting: pH, temperature, ions, photo, magnetic, ultrasound, etc.
      ii. Regulated systems: enzyme complex etc.
      iii. Ligand based targeting: Polymeric conjugates, biomacromolecular conjugates like antibody, affibody, aptamer and peptides etc.

4. **Introduction and Types of Various Dosage Forms and DDS**
   a. Nanoparticles, nanospheres, dendrimers, nanohydrogels, liposomes, niosomes, gold and iron oxide nanoparticles
   b. Brief over view of theragnostic systems

5. **Principles of Formulation of Novel Drug Delivery Systems**
   a. Introduction and brief overview of biomedical polymers, their physical and structure-property relationship.
   b. Examples of bio-responsive and stimuli responsive polymers
   c. Overview of methods to formulate polymeric nanoparticles, dendrimers, liposomes, niosomes, hydrogels and gold nanoparticles etc.
   d. Selection of ligands for delivery system with examples to targeting substrates
   e. Formulation stability issues associated with novel DDS

6. **Characterization Techniques for Novel DDS**
   a. Spectrophotometric (FT-IR, HPLC, UV, Fluorescence-spectroscopy, NMR etc.).
   b. Particles size characterization (SEM, TEM, DLS, Size-exclusion chromatography etc.).
   c. Crystalline Structure (XRD etc.).
   d. Miscellaneous techniques (AFM, Raman-spectroscopy etc.).

7. **Pharmacokinetic and Pharmacological Aspects of Novel DDS**
   a. Clearance and in-vivo stability of novel DDS
   b. Concept and strategies of designing long-circulating DDS
      i. Phenomena of surface shape, charge, size and nature
      ii. Effect of poly-ethylene glycol (PEG) and other long circulating polymers
   c. Toxicity patterns of colloidal and novel drug delivery systems.

8. **Drug and Disease Candidates for Novel DDS**
   a. Principles of selection of a disease
   b. Principles of selection of drug(s) candidates for a disease

9. **Commercial Benefits and Applications of Novel Drug Delivery Systems**
   a. Pharmaco-economic considerations
   b. Advantages of novel DDS
   c. Examples of commercialized novel DDS

10. **Introduction to Pharmaceutical Bio-Technology**
   a. Introduction to basic science and application of biotechnologically derived pharmaceutical products (antibiotics, amino acids, insulin, enzymes and vaccines etc.), scope application new findings.
   b. Role of Pharmaceutical Biotechnology in the new product development (NPD), challenges and opportunities.

11. **Isolation and Identification of Suitable Strains and their Maintenance**
   a. Genetic techniques for the strain improvement.
   b. Effect of certain Bio-chemical parameters, media composition and process optimization
   c. Isolation, extraction and purification techniques for the desired biopharmaceuticals.
   d. Upstream and downstream processes.
   e. Area design and quality requirements during manufacturing of biopharmaceutical.
   f. Commercial implications of recombinant DNA technology.
   g. The concept of gene therapy to cure genetic diseases.

12. **Pharmaceutical Biotechnology and Health with Special Reference to Treatment of Cancer and Possibly AIDS.**

Books Recommended

1. Banker, G. S. (2002). *Modern pharmaceutics* (4th ed.). Marcel Dekker Publishing. (Note: original year corrected from "20020" to "2002")
2. Crommelin, D. J. A., Sindelar, R. D., & Meibohm, B. (Eds.). (2013). *Pharmaceutical biotechnology: Fundamentals and applications*. Springer.
3. Lu, D. R., & Øie, S. (Eds.). (2004). *Cellular drug delivery: Principles and applications*. Humana Press.
4. Ratner, B. A., Hoffman, A. S., Schoen, F. J., & Lemons, J. E. (2013). *Biomaterials science: An introduction to materials in medicine* (3rd ed.). Academic Press.
5. Nature Publishing Group. Recent review and tutorial articles. Nature and related journals. https://www.nature.com.

Pharmaceutics - Biopharmaceutics & Pharmacokinetics (Lab.)

PHT-701
Cr. Hrs. 3

The laboratory course was elaborated topic viz. The experiments were designed based on the theoretical concepts of course 604.

a. To study the effect of various physiological pH on the percentage ionization of different drugs.
b. Permeability studies of the selected drugs (acidic salt of weakly basic drug and basic salt of weakly acidic drug).
c. Determination of true partition coefficient and distribution coefficient.
d. Assessment of drug(s) permeation through Franz diffusion cell.
e. Determination of apparent/effective permeability coefficient
f. Studying the effect of Noyes Whiteney's equation parameters on percentage drug release.
g. Studying the effect of different formulation and process variables on percentage drug release.
h. Concept of designing gastroretentive floating system and evaluation of buoyancy parameters and percentage drug dissolve.
i. In-vivo imaging of dosage form using animal model.
j. In vitro in vivo correlation for 2 model drugs (dissolution and in-vivo)
k. Computation of the PK parameters of the drug(s) using simulated PK models.
l. Bioanalytical method development and validation for quantification of drug(s) in biological matrices using High Performance Liquid Chromatography (HPLC).

Books Recommended

1. Bauer, L. A. (2014). *Applied clinical pharmacokinetics* (3rd ed.). McGraw-Hill Education. ISBN 978-0-07-179458-9.
2. Taylor, K. M. G., & Aulton, M. E. (Eds.). (2021). *Aulton's pharmaceutics: The design and manufacture of medicines* (5th ed.). Elsevier. ISBN 978-0702081545.
3. Curry, S. H., & Whelpton, R. (2022). *Drug disposition and pharmacokinetics: Principles and applications for medicine, toxicology and biotechnology*. Wiley. ISBN 978-1119588436.
4. Schmidt, S., & Derendorf, H. (2019). *Rowland and Tozer's clinical pharmacokinetics and pharmacodynamics: Concepts and applications* (5th ed.). Wolters Kluwer. ISBN 978-1496385048.
5. Lappin, G., & Seymour, M. (2022). *Clinical pharmacokinetics from the beginning: A practical approach*. Independently published. ISBN 979-8402337688

Pharmaceutics - Forensic Pharmacy

PHT-703
Cr. Hrs. 3

1. **Study of Drug Laws**
   The Drugs Act 1976 and rules framed there under. Provincial drug rules (Respective Drug Rules will be taught in the relevant province). Advertisement rules. Other related rules and Legal aspects.

2. **The Pharmacy Act 1967 and Amendate Pharmacy Act of 1971**

3. **The Dangerous Drugs Act, 1930**

4. **The Factory Law 1934**

5. **Shops and Establishment Ordinance, 1969 with rules**

6. **The Poisons Act 1919**

7. **Control of narcotics substances Act 1997**

Books Recommended

1. Government of Pakistan. *The manual of drug laws in Pakistan*.
2. Government of Pakistan. (1934). *The Factory Act, 1934*. https://www.na.gov.pk
3. Government of Pakistan. (1969). *Shop and Establishment Ordinance, 1969*. https://www.na.gov.pk
4. Government of Pakistan. (1997). *Control of Narcotic Substances Act, 1997*. https://www.na.gov.pk

Second Semester

Pharmaceutics - Pharmaceutical Dosage Forms - I

PHT-302
Cr. Hrs. 3

1. **Classification of Pharmaceutical Dosage Forms**
   Significance of classification, different classifications based on the following; methods of preparation. Galenicals and non-galenicals preparations, sterile and non-sterile preparations. Physical classification, pharmacological classification, classification according to mode of application, pharmaceutical classification according to release of drug, conventional dosage forms, time release products, repeat action products, prolonged action products, sustained released products, classification according to name of manufactures.

2. **Pharmaceutical Dosage Forms**
   Galenical liquid aqueous dosage forms
   Infusions, decoctions, galenical liquid non-aqueous dosage forms, alcoholic dosage forms (tinctures, fluidextracts), oleagenous dosage forms (oleoresins, infused oils), galenical solid dosage forms. Extracts, resins.

Non galenical aqueous liquid dosage forms
Aqueous dosage forms, waters, diluted acids solutions, douches, enemas, gargles, washes, juices, ophthalmic solutions. Sweet viscid aqueous dosage forms, syrups, honeys, mucilages, jellies, aqueous suspensions, suspensions, mixtures, magmas, gels, lotions.
Non-glaenical non-aqueous dosage forms
Alcoholic solutions, spirits, elixirs, dental liniments, etherial solutions (collodions), glycerine solution (glycerites), oleagenous dosage forms (oleovitamins, toothache drops, inhalations, sprays, liniments, emulsions.

3. **Parenterals**
Definition, history, types, advantages, disadvantages, uses, parenteral production area, containers and closures vehicles, pyrogens, requirements, manufacturing, testing etc.

Books Recommended

1. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage form design* (2nd ed.). Harcourt Publishers.
2. Rawlins, E. A. (Ed.). (1985). *Bentley's textbook of pharmaceutics* (8th ed.). Macmillan Publishing Co. Inc.
3. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
4. Winfield, J., & Richards, R. M. E. (2004). *Pharmaceutical practice* (2nd ed.). Prentice Hall Publishing.

Pharmaceutics - Pharmaceutical Dosage Forms (Lab)

PHT-402
Cr. Hrs. 3

This lab course encompasses the formulation of basic pharmaceutical liquid, semi-solid dosage forms. It involves the basic principles and techniques for extemporaneous preparation such as reducing and enlarging formulas, weighing, measuring, and combining/mixing raw materials into dosage form by employing different methods, and addressing fundamentals behind selection of formulating ingredients, as well as labeling and storage conditions for final product.

- Product and substance monographs as per USP, BP, Ph. Eur., JP
- Solvents used in pharmaceutical preparations.
- Preservatives used in pharmaceutical preparation.
- Suspending agents used in pharmaceutical preparation.
- Emulsifying agents used in pharmaceutical preparations.
- Coloring and flavoring agents used in pharmaceutical preparations.

The following dosage forms are prepared:

1. **Monophasic Liquid dosage form for oral use: Aromatic water, Syrups, Spirits, Tinctures, Extracts, Elixirs, Linctus, Solutions, Drops**

2. **Monophasic Liquid dosage form for external use: Lotions and Liniments**

3. **Monophasic Liquid dosage form for special use: Gargles, Mouthwashes, Paints, Ear and nasal drops, Inhalations**

4. **Biphasic Liquid Dosage form: Suspensions, Emulsions, Magmas and gels**

5. **Pharmaceutical powders: divided and bulk powders**

6. **Pharmaceutical semi-solid preparations: ointments, creams, pastes and gels**

Books Recommended

1. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
2. Rowe, R. C., Sheskey, P. J., Quinn, M. E. (Eds.). (2020). *Handbook of pharmaceutical excipients* (9th ed.). Pharmaceutical Press.
3. Aulton, M. E., & Taylor, K. M. G. (Eds.). (2021). *Aulton's pharmaceutics: The design and manufacture of medicines* (6th ed., International ed.). Elsevier.

4. Brayfield, A., & Cadart, C. (Eds.). (2024). *Martindale: The complete drug reference* (41st ed., Vols. 1–2). Pharmaceutical Press.
5. Allen, L. V., & Ansel, H. C. (2014). *Ansel's pharmaceutical dosage forms and drug delivery systems* (10th ed.). Lippincott Williams & Wilkins.

Pharmaceutics - Microbiology - II

PHT-404
Cr. Hrs. 3

1. **Sterilization and Disinfection**
   Methods of sterilization and disinfection, mechanism of killing. Kinetics of death of micro-organism, evaluation of sterilization and disinfection procedures.

2. **Fermentation**
   Fermentation and respiration, ranges of fermentation, parameters of fermentation. Production of pharmacologically active fermentation products, selection of a suitable medium, isolation and recovery, kinetics of microbial growth, continuous culture application in fermentation, engineering aspect of fermentation.

3. **Biologicals**
   Vaccines, classification of vaccines, production of vaccines and antisera. DNA recombinant technology for preparing vaccines Hormones and other biologicals. Pyrogen, sterility and toxicity tests.

4. **Antibiotics**
   Definitions, classification of antibiotics, mode of actions, antimicrobial spectrum and side effects of different groups of antibiotics.

5. **Factory and Hospital Hygiene**
   Introduction, control of microbial contamination during manufacturing, manufacturing of sterile products.

Books Recommended

1. Gilmore, B. F., & Denyer, S. P. (Eds.). (2023). *Hugo & Russell's pharmaceutical microbiology* (9th ed.). Wiley-Blackwell.
2. Reed, G. (Ed.). (2004). *Prescott & Dunn's industrial microbiology* (4th ed.). CBS Publishers & Distributors.
3. Crommelin, D. J. A., & Sindelar, R. D. (1997). *Pharmaceutical biotechnology: An introduction for pharmacists and pharmaceutical scientists*. Harwood Academic Publishers.
4. Pelczar, M. J., Jr., Chan, E. C. S., & Krieg, N. R. (2023). *Microbiology* (5th ed.). McGraw-Hill Education.
5. Collins, C. H., Lyne, P. M., & Grange, J. M. (2004). *Collins and Lyne's Microbiological Methods* (8th ed.). Arnold.

Pharmaceutics - Physical Pharmacy

PHT-414
Cr. Hrs. 3

1. **Physico-Chemical Principles**
   Solutions: Introduction, types, concentration expressions ideal and real solution, colligative properties, their mathematical derivations and application in Pharmacy, molecular weight determinations, distribution co-efficient and its applications in Pharmacy solubilization, solubility factor affecting solubility. HLB-value, surfactants, their properties and types. Micelles, their formulation and types, ionization. pH, pH indicators, pKa, buffer's equation. Isotonic solutions and their applications in pharmacy.

2. **Micromeritics**
   Particle size and shapes, distribution of particles methods of determination of particle size and importance of particle size in pharmacy.

3. **Dispersion**
   Colloids: Types, methods of preparation, properties (optional, kinetic, electrical). Dialysis and artificial kidney,

stability of colloids, protection and sensitization phenomenon and application of colloids in Pharmacy.
Emulsions: Types, theories of emulsification, emulsifying agents their classification and stability of emulsion.
Suspensions: Types, methods of preparation, properties, suspending agents, their classification and stability.
Adsorption: Techniques and processes of adsorption in detail.

4. **Rheology**
Definition and fundamental concept. Properties contributing to rheological behaviour. Graphic presentation of rheological data.

5. **Rate and Order of Reactions**

6. **Kinetic Principles and Stability Testing, Theoretical Considerations**
Degradation, physical factors, influence of pH, temperature, ionic strength, acid base catalysis, UV light. Chemical factors. Complex chemical reactions, oxidation-reduction hydrolysis.

Books Recommended

1. Martin, P., Bustamante, P., & Chun, A. H. C. (1999). *Physical and chemical principles of pharmaceutical science* (4th ed.). New York Publisher.
2. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage form design* (2nd ed.). Harcourt Publishers.
3. Rawlins, E. A. (Ed.). (1977). *Bentley's textbook of pharmaceutics* (8th ed.). Macmillan Publishing Co. Inc.
4. Banker, G. S., & Rhodes, C. T. (2002). *Modern pharmaceutics* (4th ed., rev. and expanded). Marcel Dekker, Inc.
5. Carstensen, J. T., & Rhodes, C. T. (Eds.). (2000). *Drug stability: Principles and practices* (3rd ed., rev. and expanded). Marcel Dekker.

Pharmaceutics - Physical Pharmacy (Lab)

PHT-502
Cr. Hrs. 3

Practical Elaborating Theory Course
Experiments to demonstrate some of physico-chemical processes, like simple distillation, steam distillation, crystallization, Dialysis.
Determination of emulsion systems. Practicals based on rheological and structural character of emulsions stabilized by mixed films of emulsifier.
Determination of particle size, angle of repose of powders. Preparation of buffer solutions and isotonic solution.
Determination of percentage composition of solutions by specific gravity method.
Partition-coefficient, surface tensions, viscosity.
Determination of various pH by acidic and alkaline buffers.
Drug stability experiments, preparation of stock solution (dilution method).
Determination of critical micelle concentration (CMC) of surface-active agents. Flocculation and deflocculation of Kaolin Suspensions.

Books Recommended

1. Martin, P., Bustamante, P., & Chun, A. H. C. (1999). *Physical and chemical principles of pharmaceutical science* (4th ed.). New York.
2. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage form design* (2nd ed.). Harcourt Publishers.
3. Rawlins, E. A. (Ed.). (1977). *Bentley's textbook of pharmaceutics* (8th ed.). Macmillan Publishing Co. Inc.
4. Banker, G. S., & Rhodes, C. T. (2002). *Modern pharmaceutics* (4th ed., rev. and expanded). Marcel Dekker, Inc.
5. Carstensen, J. T., & Rhodes, C. T. (Eds.). (2000). *Drug stability: Principles and practices* (3rd ed., rev. and expanded). Marcel Dekker.

Pharmaceutics - Industrial Pharmacy - I (Unit Operations)

PHT-504
Cr. Hrs. 3

1. **Mixing**
Fundamentals, mechanism. Mixing equipment used in liquid/liquid, liquid/solid and solid/solid mixing. Comminution (size reduction), Reasons for size reduction. Factors affecting size reduction, size analysis. Sieving, energy mills (Ball mill, edrunner, edge runner mill disintegrant, colloid mill, hammer mill, cutter mill, fluid energy mill etc.).

2. **Drying**
   Theories of drying, drying of solids, classification of dryers, general methods, fluidized bed systems, pneumatic systems, spray dryer, freeze drying
   Clarification and Filtration
   Theory, filler media, filter aids, filter selection, equipment used for filtration.

3. **Evaporation**
   General principles of evaporation, evaporators, evaporation under reduced pressure.

4. **Compression and Compaction**
   The solid-air interface, angle of repose, flow rates, mass volume relationship, density, Heckel plots, consolidation, granulation, friability, compression (dry method, wet method, slugging), physics of tableting. Tableting machines and other equipment required, problems involved in tableting, tablet coating.

5. **Encapsulation**
   Capsulation hard and soft gelatin capsules

Books Recommended

1. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage form design* (2nd ed.). Harcourt Publishers.
2. Lachman, L., Lieberman, H. A., & Kanig, J. L. (1986). *The theory and practice of industrial pharmacy* (3rd ed.). Lea & Febiger.
3. Swarbrick, J. (Ed.). (2002). *Encyclopedia of pharmaceutical technology.* Marcel Dekker Publishing.

Pharmaceutics - Biopharmaceutics & Pharmacokinetics (I)

PHT-604
Cr. Hrs. 3

1. **Biopharmaceutics**
   a. Introduction to biopharmaceutics, biopharmaceutics classification system (BCS) basic pharmacokinetics, and biopharmaceutics properties.
   b. Comprehensive explorations of solubility, permeability, and dissolution.
   c. Practical discussions of the use of biopharmaceutics to inform candidate drug selection and optimization, as well as biopharmaceutics tools for rational formulation design.
   d. In-depth examinations of biopharmaceutics classification systems and regulatory biopharmaceutics, as well as regulatory biopharmaceutics and the impact of anatomy and physiology.
   e. Definition and concept, bioavailability.
   f. Physiology of the G.I.T. Physiologic factor affecting the physiochemical. Formulation factor.
   g. Dissolution, factor effecting the dissolution for the absorption of the drug.
   h. Physiology of the skin. Physiological factors affecting the absorption of drug through the skin.
   i. Parenteral release dosage form. Route of administration, physiological factor effecting the absorption of the drug.
   j. Biopharmaceutics of other dosage form.
   k. Evaluation of biopharmaceutical properties of drugs, dissolution properties and permeability determination methods.
   l. Formulation factors affecting drug bioavailability.

2. **Pharmacokinetics**
   a. Review of mechanical fundamentals, rate and order of reaction
   b. Definition and concept of pharmacokinetics. Determination through plasma level
   c. Introduction to invitro in vivo (IVIVC) correlation studies.

Books Recommended

1. Batchelor, H. (Ed.). (2021). *Biopharmaceutics: From fundamentals to industrial practice*. Wiley. ISBN 978-1119678281
2. Bauer, L. A. (2014). *Applied clinical pharmacokinetics* (3rd ed.). McGraw-Hill Education. ISBN 978-0-07-179458-9
3. Curry, S. H., & Whelpton, R. (2022). *Drug disposition and pharmacokinetics: Principles and applications for medicine, toxicology and biotechnology*. Wiley. ISBN 978-1119588436
4. Lappin, G., & Seymour, M. (2022). *Clinical pharmacokinetics from the beginning: A practical approach*. [Self-published]. ISBN 979-8402337688

5. Shargel, L., & Yu, A. B. C. (2021). *Applied biopharmaceutics & pharmacokinetics* (8th ed.). McGraw-Hill Education. ISBN 978-1260142990

Pharmaceutics - Clinical Pharmacokinetics

PHT-606
Cr. Hrs. 3

1. **Compartment Models**
   One compartment model. Two compartment models. Three compartment models. Non-compartmental models.
2. **Biological Half-life in Vitamin**
3. **Clearance, Elevation**
4. **Protein Bounding**
5. **Multiple dosage**
6. **Application of Pharmacokinetics in Clinical Situation**
7. **Application in Dosage Sites**
8. **Bioavailability and bioequivalence testing**
9. **Pharmacokinetics of intravenous infusion**

Books Recommended

1. Bauer, L. A. (2008). *Applied clinical pharmacokinetics* (2nd ed.). McGraw-Hill. ISBN 0071476288
2. Bonate, P. L., & Howard, D. R. (Eds.). (2004). *Pharmacokinetics in drug development: Regulatory and development paradigms* (Vol. 2). AAPS Press. ISBN 0971176736
3. Boroujerdi, M. (2002). *Pharmacokinetics: Principles and applications*. McGraw-Hill Professional Publishing. ISBN 0071351647
4. Schoenwald, R. D. (2002). *Pharmacokinetics: Principles of dosing adjustment*. CRC Press.
5. Shargel, L. (2002). *Biopharmaceutics and pharmacokinetics* (4th ed.). McGraw-Hill.

Pharmaceutics - Pharmaceutical Technology (Lab)

PHT-614
Cr. Hrs. 3

1. **To prepare matrix tablet of drugs by single-punch machine**
   a. Preparation of matrix tablet for less water-soluble drug
   b. Preparation of matrix tablet for highly water-soluble drug
   c. Perform dissolution testing by USP method I and II
2. **Formulation of 2 Model Drugs (highly soluble and less soluble) in Nano particles/Micro particles**
   a. To prepare polymeric Nano/Micro particles by single / double emulsion / nanoprecipitation method(s)
      i. Hydrophilic drugs by double emulsion method
      ii. Hydrophobic drugs by single emulsion method
      iii. Hydrophobic drugs by nanoprecipitation method
   b. To visualize the nano/microparticles under stereromicroscope
   c. To perform the release testing of 2 model drugs from nanoparticles stirring method (UV-visible spectroscopy)
3. **To prepare the oral formulation of drugs by extrusion/spheronization method**
   a. Matrix based pellets
   b. Coated pellets (perform coating)
   c. Pellitization to form immediate release, controlled/extended release and enteric coated pellets.

4. **To observe the geometry and surface of spheronized formulation (pellets) by stereomicroscope**
5. **To perform the release testing of drugs from spheronized (pellets) particles by USP method I and II**
6. **To compare and study the swelling and disintegration profile (physical deformation) of expired vs. valid film, enteric coated tablets and hard gelatin capsules**
   The experiment involves the physical phenomena that happens to expired tablets specially the coating of polymers since they tend to be oxidized or cured over the period of time and may hamper the disintegration of tablets and capsules.
7. **To develop transdermal patches of suitable active pharmaceutical excipients.**
8. **To develop bilayer-tablet formulations of different active pharmaceutical ingredients.**
9. **Fast dispersible tablet formulations different NSAIDs.**
10. **To develop osmotically-controlled tablet formulations for control over extended period of time.**
11. **To preparation pharmaceutical hydrogels.**
12. **To prepare liposomal formulations of 2 model drugs (highly soluble and low soluble).**

Books Recommended

1. Aulton, M. E. (2002). *Pharmaceutics: The science of dosage form design* (2nd ed.). Harcourt Publishers.
2. Banker, G. S., & Rhodes, C. T. (2002). *Modern pharmaceutics* (4th ed., rev. and expanded). Marcel Dekker, Inc.

Pharmaceutics - Prescription & Community Pharmacy

PHT-702
Cr. Hrs. 3

1. **Basic Principles of Compounding and Dispensing**
   Weights and measures. Calculations for compounding and dispensing. Fundamental preparations in compounding. Containers and closures for different products. Prescription handing, Parts of prescription, filling, labelling, pricing of dispensed medication.

2. **Extemporaneous Dispensing**

3. **Pharmaceutical Incompatibilities**
   Types of incompatibilities. Manifestations, correction and prevention with reference to typical examples.

4. **I. V. admixtures**

5. **Dispensing of radio pharmaceuticals**

6. **Definitions and background of community pharmacy**

7. **Epidemiology and its control. Prevents Health (EPI & CDC). Family planning. Health policy and national drug policy.**

8. **Patient assessment.**

9. **Medical compilation of drug administration (general & socio-economic aspects).**

10. **Patient pharmacist communication.**

11. **Patient education and counseling.**

12. **Control of drug abuse and misuse.**

13. **Role of pharmacist as public health educator in the community for drug monitoring and drug information.**

Books Recommended

1. Carter, S. J. (Ed.). (2008). *Cooper and Gunn's dispensing for pharmaceutical students* (12th ed.). CBS Publishers & Distributors Pvt Ltd.
2. Robertson, R. (Ed.). (1998). *Management of drug users in the community: A practical handbook* (1st ed.). Hodder Education Publishers.

3. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
4. Brayfield, A., & Cadart, C. (Eds.). (2024). *Martindale: The complete drug reference* (41st ed., Vols. 1–2). Pharmaceutical Press.

Pharmaceutics - Pharmaceutical Management & Marketing

PHT-704
Cr. Hrs. 3

1. **Management**
   Nature and principles of management, types and functions of managers.

2. **Planning**
   Purpose and types of planning, steps in planning. Organizing, management control systems. Purpose, steps in the control process. Forms of operations control. Requirements for adequate control. Critical control points and standards. Motivation, innovation and creativity, communication.

3. **Production Management**
   Material management, supply chain, demand management, regulatory control.

4. **Marketing Management**
   Marketing channels, promotion, advertising and salesmanship. Promotion marketing.

5. **Sales Management**
   Personnel, buying, receiving and pricing, Sales promotion and customer services.

6. **Pharmacy Layout Design**
   Objectives of layout design. Types of community pharmacies. Pharmaceutical centre, prescription-oriented pharmacies, traditional pharmacies, the super drug store.
   Consumer goods and purchases. Classes of layout designs. Principles and characteristics of layout design. Traffic flow analysis.

Books Recommended

1. Tharp, C. P., & Lecca, P. J. (1979). *Pharmacy management for students and practitioners* (2nd ed.). Mosby.
2. Smith, H. A. (1986). *Principles and methods of pharmacy management* (3rd ed.). Lea & Febiger.
3. McFarland, D. E. (1979). *Management: Foundations and practices* (5th ed.). Macmillan.
4. Kreitner, R., & Cassidy, C. (2012). *Management* (12th ed.). Cengage Learning.
5. Newman, W. H., Summer, C. E., & Warren, E. K. (1972). *The process of management: Concepts, behavior, and practice* (3rd ed.). Prentice-Hall.

Pharmaceutics - Prescription Pharmacy (Lab)

PHT-706
Cr. Hrs. 3

Practicals Elaborating Theory Course
Preparation and dispensing of:
Syrups, mixtures, ointments, creams, lotions, pastes, ear drops, glycerite, mouth wash, nasal drops etc.

Books Recommended

1. Carter, S. J. (2008). *Cooper and Gunn's dispensing for pharmaceutical students* (12th ed.). CBS Publishers & Distributors Pvt. Ltd.
2. Robertson, R. (Ed.). (1998). *Management of drug users in the community: A practical handbook* (1st ed.). Hodder Education Publishers.
3. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
4. *Brayfield, A., & Cadart, C. (Eds.). (2024). Martindale: The complete drug reference (41st ed., Vols. 1–2). Pharmaceutical Press.*

Pharmaceutics - Pharmaceutical Quality Management

PHT 708
Cr. Hrs. 3

1. **Introduction and Concept of Pharmaceutical Quality and its Historical Perspective**
2. **Elements and Description of Pharmaceutical Quality System (PQM)**
3. **ICH Q9 (Quality Risk Management), ICH Q8 (Pharmaceutical Product Development).**
4. **ICH Q10 (Pharmaceutical Quality Systems): Lifecycle Stage Goals, Management Responsibilities, Elements of Pharmaceutical Quality Management System (QMS),.**
5. **GMP principles and practices.**
6. **Validation in Pharmaceutical Industry.**
7. **Pharmaceutical Annual Quality Review: (PAQR).**
8. **Overview of Global Regulatory Framework, Guidance and Resource Databases.**
9. **Common Technical Document (CTD; M4).**
10. **Emerging trends in Pharmaceuticals.**
11. **Overview of Lean, Operational Excellence and Continuous Improvement.**

Books Recommended

1. Garza-Reyes, J. A., Kumar, V., & Rocha-Lona, L. (2013). *Building quality management systems: Selecting the right methods and tools*. Springer.
2. Haider, S. I. (2001). *Pharmaceutical master validation plan: The ultimate guide to FDA, GMP, and GLP compliance* (1st ed.). CRC Press.
3. International Council for Harmonisation. ICH guidance documents: Q2, Q8, Q9, Q10, Q12; CTD M4. https://www.ich.org
4. Ostrove, S. (2016). *How to validate a pharmaceutical process* (1st ed.). Academic Press.
5. U.S. Food and Drug Administration. (2011). *Pharmaceutical process validation – life cycle approach*. https://www.fda.gov

Courses Schedule
Pharm. D. (Deficiency) Program

1st Semester			2nd Semester		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHT -513 (D)	Computer Application in Pharmacy	2	PHT-606 (D)	Clinical Pharmacokinetics	3
PHT -613 (D)	Pharmaceutical Technology	3	PHT-614 (D)	Pharmaceutical Technology (Lab)	3
-	-	-	PHT-702 (D)	Clinical Pharmacy	3
-	-	-	PHT-708 (D)	Pharmaceutical Quality Control and Assurance	2
Total **6** courses, making **16** Credit hours in one year.					

Pharm. D. Deficiency Courses - Outline
First Semester

Computer Application in Pharmacy (Practical)

PHT-513(D)
Cr. Hrs. 2

1. **Introduction to Microsoft Windows and its Different Packages Like MS Word, Excel, PowerPoint and Access**
2. **Internet and Email**
   Internet and microsoft internet explorer 5, searching the internet E-mail and News group. Favourites, security and customizing explorer.
3. **Web Page Development**
   Introduction to frontpage, creating a first Website, basic formatting technique, manipulating tables within frontpage, frontpage, pictures and multimedia, hyperlinking, bookmarks and image maps, Frontpage and frames. Managing your web, good site design
4. **Complete Statistical Packages, Statistica®**
5. **Languages, at Least Two Prevailing Languages Will be Taught**

Books Recommended

1. Lambert, J., & Frye, C. (2022). *Microsoft Office step by step (Office 2021 and Microsoft 365)* (1st ed.). Microsoft Press.
2. Lambert, J. (2022). *Microsoft Excel step by step (Office 2021 and Microsoft 365).* (1st ed.). Microsoft Press.
3. Gralla, P. (2006). *How the internet works* (8th ed.). Que Publishing.
4. Robbins, J. N. (2018). *Learning web design: A beginner's guide to HTML, CSS, JavaScript, and web graphics* (5th ed.). O'Reilly Media.
5. Columbus, L. (2008). *The MS-Windows XP Professional Handbook* (1st ed.). Laxmi Publications Pvt Limited.
6. TIBCO Software Inc. (2024). *TIBCO Statistica: User's guide*. TIBCO Software. https://docs.tibco.com
7. TIBCO Software Inc. (2024). *Electronic statistics textbook*. TIBCO Software. https://www.statsoft.com/textbook/
8. Herrera, C., & Hajek, D. W. (2023). *Introduction to Computers* (2023 ed.) Independently Published.

Pharmaceutical Technology

PHT-613(D)
Cr. Hrs. 3

1. **Principles of Pharmaceutical Formulation and Dosage Form Design, Product formulation, need for dosage form, pre-formulation studies.**

2. **Formulation Development**
   Pharmaceutical aerosols, ophthalmic preparations, parenteral preparations.

3. **Advanced Formulation Techniques**
   Development of a formulation methodology and flow plan for the new product. New technologies in drug delivery system.

4. **Pharmaceutical Biotechnology**
   Biotechnological aspects in the product development. Fundamentals of genetic engineering and its application in medicine. Principle, synthesis and application of monoclonal antibodies, introduction to Gene therapy. Immmobilized enzymes and their application in medicine. Production of biotech compounds, biotech vaccines, dispensing of biotech compounds.

5. **Novel Drug Delivery Systems**
   Introduction to the drug carrier, liposomcs as a drug carrier, niosomes as a drug carrier, biodegradable polymers as a drug carrier, active and passive drug delivery system, other novel GIT systems, novel topical drug delivery systems.

6. **Modified Drug Release Dosage Form**
   The concept of sustained release, first order release approximation, multiple dosing, implementation of designing, approaches based upon dosage form modification. Product evaluation and testing, matrices tablets, control release technology. Microencapsulation, method of particle coating, instrumentation in granule manufacturing.

Books Recommended

1. Banker, G. S. (2002). *Modern pharmaceutics* (4th ed.). Marcel Dekker Publishing.
2. Chein, Y. W. (2004). *Novel drug delivery system.* Marcel Dekker Publishing.
3. Crommelin, D. J. A., & Sindelar, R. D. (2002). *Pharmaceutical biotechnology.* Taylor & Francis.

Second Semester

Clinical Pharmacokinetics

PHT-606 (D)
Cr. Hrs. 3

1. **Compartment Models**
   One compartment model. Two compartment models. Three compartment models. Non- compartmental models.

2. **Biological Half-Life in Vitamin**
3. **Clearance, Evaluation**
4. **Protein Binding**
5. **Multiple Dosing Regimens**
6. **Application of Pharmacokinetics in Clinical Situation**
7. **Application in Dosage Sites**
8. **Bioavailability and Bioequivalence Testing**
9. **Pharmacokinetics of Intravenous Infusion**
10. **Non-Linear Pharmacokinetics**

Books Recommended

1. Gibaldi, M. (1991). *Biopharmaceutics and clinical pharmacokinetics* (4th ed.). Lea & Febiger.
2. Schoenwald, R. D. (2000). *Pharmacokinetics: Principles of dosing adjustment.* CRC Press.
3. Shargel, L. (2002). *Biopharmaceutics and pharmacokinetics* (4th ed.). McGraw-Hill.

Pharmaceutical Technology (Practical)

PHT-614(D)
Cr. Hrs. 3

1. **Blood sampling techniques in laboratory animals like dog, rabbits, mice etc. in human-beings.**
2. **Plasma level time curve determination of pharmacokinetic parameters**
3. **In-vitro dissolution studies**
4. **Optional dose determination.**
5. **Measurement of rate of bioavailability.**
6. **Determination of plasma protein binding.**
7. **Determination of relative and absolute bioavailability.**
8. **Urinary sampling techniques.**
9. **In laboratory animals. In humans, renal excretion of drugs or drug disposition.**
10. **Various techniques to develop the controlled release formulation**
11. **Biotechnological aspects of product development**
12. **Coating of particles**
13. **To prepare, examine and control specifications of packaging materials**

Books Recommended

1. Banker, G. S. (2002). *Modern pharmaceutics* (4th ed.). Marcel Dekker Publishing.
2. Crommelin, D. J. A., & Sindelar, R. D. (2002). *Pharmaceutical biotechnology.* Taylor & Francis.
3. Hellery, A. M., & Lloyd, A. W. (2001). *Drug delivery and targeting: For pharmacists and pharmaceutical scientists.* Taylor & Francis.
4. Jain, N. K. (1997). *Controlled and novel drug delivery* (1st ed.). CBS Publishers & Distributors.
5. Ramabhadran, T. V. (1994). *Pharmaceutical design and development: A molecular biology approach* (1st ed.). CRC Press.

Clinical Pharmacy

PHT-702(D)
Cr. Hrs. 3

1. Rational Use of Drugs
2. Rational prescribing, rational dispensing, problems of irrational drug use, learning about drug use problem, sampling to study drug use, indicators of drug use.

3. Introduction to Essential Drugs
4. Criteria for selection, use, advantages.
5. Drug Utilization evaluation & Drug Utilization Review (DUE/PUR)
6. Development of protocol of use of low very low therapeutic index drugs (Steroids, Vancomycin, Cimetidine etc.).
7. Drug abuse and misuse. Drug induced modification of lab test values and drug induced diseases.
8. Practical Pharmacokinetics
9. Therapeutic drug monitoring of the narrow therapeutic range drugs and other essential drugs.
10. Pharmacoeconomic studies
11. Pharmaceutical care its scope, management and application of care plan.
12. Role of clinical pharmacist in community pharmacy.
13. Save intravenous therapy and hazards of intravenous therapy
14. Non-compliance: Definition, introduction and importance. Extent of non-compliance. Methods of assessment.
15. Reasons for non-compliance. Strategies for improving compliance.
16. Designing of compliance trials.
17. Patient Counseling
18. Patient Profile: Patient disease profile, taking case history, drug profile of 25 drugs.
    Adrenaline, aminoglycosides, anti TB drugs, antiepileptics, atropine, benzodiazepines, cepahlosporins, 20. chlorpheniramine, cimetidine, digoxin, dobutamine, dopamine, fluroquinolone, frusemide, lactulose, macrolides, metoclopramide, morphine/pethedine, nifedipine, NSAIDS. ORS, penicillins, prednisolone, salbutamol, vancomycin,
19. Utilization of clinical drug literature: Introduction. Drug literature selection. Drug literature evaluation. Drug literature communication withdrawal, detection, reporting and management of ADR.
20. Computers in clinical pharmacy:
21. Role of Pharmacist in clinical trials of drug substances.
22. Designing of clinical trials. Types or trials. Choice of patients. Exclusion of patients. Monitoring a clinical trial.
23. Drug Interactions and Adverse Drug Reactions
24. Drug Interactions: Mechanism, physiological factors affecting interaction. Types and level of drug interactions. Role of pharmacist in evaluating drug interactions and its management.
25. Adverse drug reactions and side effects: Classification, Excessive pharmacological response. Idiosyncrasy, secondary pharmacological effects. Allergic drug reactions, General toxicity, toxicity following drug.

Books Recommended

1. Aulton, M. E. (2000). *Pharmaceutical practice*. Prentice Hall Publishing.
2. DiPiro, J. T. (Ed.). (2002). *Encyclopedia of pharmacy*. Marcel Dekker Publishing.
3. Rantucci, M. J. (1997). *Pharmacists talking with patients: A guide to patient counseling*. Lippincott Williams & Wilkins.
4. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0

Pharmaceutical Technology (Practical)

PHT-708(D)
Cr. Hrs. 2

1. **Good Manufacturing Practices for Pharmaceuticals**
   Control of components and drug product containers and doses. Production and process controls. Packaging and labelling controls. Holding and distribution. Repackaging and re-labelling.

2. **Validation of Pharmaceutical Process**
   Regulating basis for person validation, sterilization validation of sterile products. Sterile product validation. Validation of solid dosage form., Process validation and quality assurance. Prospective process validation, validation for water system for sterile and non-sterile products, cleaning validation, equipment validation, process validation of law materials. Analytical method validation, computer system validation, validation of diluted aerosole

3. **Different tests of liquids, emulsion, Solid state and Time Release Product**
   Biological assays, biological methods, bioassay of antibiotics. Standard preparation and unit of activity. Assay of vitamins, hormones.

4. **Miscellaneous Tests**
   Toxicity tests and identification test, ash contents etc. general knowledge of B.P, B.P.C. USP, N. etc. Statistical interpretation of quality controls data, quality control and 5.5.

5. **Quality Assurance of Hospital and Clinical Pharmacy**

Books Recommended

1. DiPiro, J. T. (Ed.). (2003). *Encyclopedia of clinical pharmacy*. Marcel Dekker Publishing.
2. Nash, R. A., & Wachter, A. H. (Eds.). (2005). *Pharmaceutical process validation* (3rd ed.). Marcel Dekker Publishing.
3. Willig, S. H. (2000). *Good manufacturing practices for pharmaceuticals*. Marcel Dekker Publishing.

Faculty of **Pharmacy and Pharmaceutical Sciences**

Department of Pharmaceutical Chemistry

Message from the Chairman

It is a matter of immense pleasure and satisfaction that the Faculty of Pharmacy and Pharmaceutical Sciences keeping abreast with its tradition is publishing the faculty catalogue 2025. The history of this publication dates back to 1974 when the first such catalogue was published and since than its unhindered publication has become a vogue. This catalogue is actually a manifestation of the desire and commitment of the faculty to enlighten its students with the entire course of action, whether academic or otherwise, that the students need to undertake during their five years of stay at the faculty. It is also a primary source of guidance and carries all the necessary information that the undergraduate students may require to keep themselves updated with the brass tacks of courses of study as well as the nooks and corner of the faculty.

Being the former dean, I am well aware that such tasks, though important, are quiet pain staking and onerous, and demand a great deal of sense of responsibility. I on behalf of my department congratulate the dean and appreciate the efforts of the publishing committee for this accomplishment.

I am sure that the students will benefit from this catalogue to its utmost and follow the path delineated in this catalogue to make their five years journey at the faculty a successful and fruitful venture.

I wish all the best to the students.

Prof. Dr. Faiyaz H. M. Vaid

Department of **Pharmaceutical Chemistry**

The Department of Pharmaceutical Chemistry was established in 1973 as independent unit of the Faculty of Pharmacy and since then performing its dynamic and active role in pharmacy education and research. The department offers Pharm. D., M.Phil. and Ph.D. courses. The undergraduate program of the department is dedicated to educate and train the students to produce active, skilled and responsible future pharmacist for academia, industry, hospitals, government and other health care setups. Courses offered by the department are based on organic, physical, analytical, instrumental and medicinal chemistry revolving around drug discovery and development. The curriculum also focuses on laboratory experience supported by an excellent teaching and infrastructure. Department comprised of two separate large buildings having spacious classrooms and well-equipped lab facilities.

The department currently boasts a dedicated faculty comprising seven professors and three assistant professors, all actively engaged in both teaching and research. Over the past five decades, the department has been privileged to have numerous eminent and senior professors, including four, who have served as Dean of the Faculty. It is a great honor that distinguished scientists and scholars such as Prof. Dr. Z. S. Saify (former Dean, Faculty of Pharmacy, Vice Chancellor and Professor Emeritus, University of Karachi) and Prof. Dr. Iqbal Ahmed (Sitara-e-Imtiaz) have been associated with the department, contributing over fifty years of invaluable service.

The department has a rich history of excellence in research and until now more than two hundred M.Pharm., M.Phil., and Ph.D. research scholars have been produced. Additionally, several hundred research papers have been published in renowned academic journals. The department offers dynamic and diverse research disciplines, including the synthesis of biologically active lead molecules, computer-aided drug design, photochemistry, natural product chemistry, stability testing, method development, and the medical applications of nanotechnology (nanomedicines).

The department not only believes but also striving to provide standard education to improve knowledge and skills with professional and personal grooming of the future Pharmacists.

Contact Details

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Vision and Mission Statement

• Vision

To embark upon a consistent intellectual and scientific journey with a aim of providing high quality education and research opportunities.

• Mission

To nurture the capabilities and potential of all knowledge seekers in a highly inspiring and academic environment fostering critical thinking and leadership qualities in the field of Pharmaceutical Sciences.

Group Photo of the Department

Sitting, from L to R: Prof. Dr. Safila Naveed, Prof. Dr. Sohail Hassan, Prof. Dr. Faiyaz H. M. Vaid, Prof. Dr. Nousheen Mushtaq, Prof. Dr. Asia Naz

Standing, from L to R: Dr. Urooj Nazim, Dr. Rubina Siddiqui, Dr. Shazia Haider

Dr. Faiyaz H. M. Vaid

Designation: **Chairperson & Professor**
Qualification: **Ph.D. M.Pharm. B.Pharm. (University of Karachi)**
Year of Association: **2002**
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Phone: **(+92-21) 99261300-7 Ext 2203**

Prof. Dr. Faiyaz H.M. Vaid is an eminent scholar and researcher at the University of Karachi, serving as a professor in the Department of Pharmaceutical Chemistry. He also held the position of Dean at the Faculty of Pharmacy and Pharmaceutical Sciences from 2021 to 2023.

Dr. Vaid has made remarkable contributions to pharmaceutical sciences, with number of high-impact research publications. He contributed chapters as a co-author for two internationally published books on Pharmaceutical Sciences. His leadership has been instrumental in producing hundreds of graduates, including Ph.D. and M.Phil. scholars.
In addition to his academic accomplishments, Dr. Vaid is recognized in literary circles as a renowned poet. He has mentored students as the patron of the faculty's literary society, fostering their creative and professional growth. This reflects his dedication to nurturing holistic development alongside academic excellence.

Dr. Vaid's multifaceted career underscores his commitment to innovation in pharmaceutical education, research, and creative expression, making him a notable figure in both scientific and literary domains.

Dr. Nousheen Mushtaq

Designation: **Professor**
Qualification: **Ph.D. M.Phil. B.Pharm. (University of Karachi)**
Year of Association: **2002**
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Dr. Nousheen Mushtaq has nearly three decades of experience as a dedicated educator and researcher in the Department of Pharmaceutical Chemistry. She is deeply committed to inspiring students to grasp and apply key concepts and strategies within the field. Beyond the classroom, she has contributed to curriculum design, participated and organized national and international training programs and learning courses. She has also been actively involved in co-curricular initiatives aimed at enhancing student growth and development.

Dr. Nousheen is an experienced researcher with numerous publications focusing on computer-aided drug design. She specializes in targeted synthesis of bioactive compounds focusing on pain, depression, and neurodegenerative diseases. She has held multiple academic positions and administrative responsibilities and serves on professional boards and editorial committees, demonstrating her commitment to continuous learning and professional development.

Dr. Sohail Hassan

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
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Dr. Sohail Hassan is a Professor in the Department of Pharmaceutical Chemistry, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, has made significant contributions to the field of pharmaceutical sciences. He received his Ph.D. in 2003 and began his academic career as an Assistant Professor in the Department of Pharmaceutical Chemistry, in 2006 advancing to Associate Professor in 2016 and Professor in 2023. He served as Chairman of the department from 2021 to 2024 fostering, its academic and administrative growth.

Dr. Sohail's areas of interest include analytical and medicinal chemistry. He has published over 40 research articles in HEC-recognized international journals. He has supervised 5 Ph.D. and 23 M.Phil. students, with 10 Ph.D. and 5 M.Phil. students currently under his guidance. As an active member of the University's Senate, Academic Council, Board of Faculty, Board of Studies, and various university committees, Dr. Sohail continues to shape the future of pharmaceutical education and research.

Dr. Asia Naz

Designation: **Professor**
Qualification: **Post Doc (USA) Ph.D., B.Pharm. (University of Karachi)**
Year of Association: **2012**
Email: **asia.naz@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2203, +92-3323117226**

Dr. Asia Naz Awan received her Ph.D. in Pharmaceutical Chemistry from the Faculty of Pharmaceutical Sciences, University of Karachi in 2009 and Post-doctorate from Bindley Bioscience, Purdue University (USA) in Nanotechnology in 2013. The basis of her work stems from a multidisciplinary background and skills developed in the field of analytical chemistry, medicinal chemistry, bionanotechnology and drug delivery. She is a Professor at the Department of Pharmaceutical Chemistry. Her research group extensively published in biosensors, drug enzyme interaction kinetics and drug dynamics, in silico studies and nanotechnology applied to human health. They are interested in developing smart therapeutics drug delivery for AMR, Alzheimer, cancer and immunotherapy. She has been awarded for Best University Teacher Award 2010 by HEC Pakistan. She won Best Research Paper Award of 2015/2016 in the field of Pharmacy by HEC. Additionally, she is working as Co-patron of Pharmacy scientific club, focal person of ORIC & QC, member of Faculty Board of Studies, and Departmental Board of Studies.

Dr. Safila Naveed

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2023**
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Dr. Safila Naveed is a Professor in the Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Karachi. She holds a Ph.D. and M.Phil. in Pharmaceutical Chemistry from the University of Karachi. She had been associated with Jinnah University for Women from 2011-2023. She has held several key academic and administrative positions, including Dean Research and Dean Faculty of Pharmacy at Jinnah University for Women, Karachi (2020-2023), where she played a pivotal role in advancing research and academic standards. Prior, she was associated with Hamdard University (2005-2011). In addition to academia, she has practical experience in hospital and pharmaceutical industry settings (2002-2004).

Her research interests include drug interactions, assay method development, phytochemistry, and formulation of new agents. With over 20 years of experience in academia she has supervised more than 40 M.Phil. and Ph.D. students contributing significantly to the field through her extensive research. Her dedication to teaching, research, and mentorship has significantly contributed to the advancement of pharmaceutical sciences in Pakistan.

Dr. Shazia Haider

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2012**
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Phone: **(+92-21) 99261300-7 Ext. 2203**

Dr. Shazia Haider is an esteemed academic and researcher. Teaching is approached with great enthusiasm with the goal of inspiring and engaging students throughout their academic journey. She also facilitates students' activities to build confidence and enhance problem-solving, critical thinking, and communication skills, preparing them for real-world challenges. She has made significant contributions to medicinal chemistry by exploring innovative approaches for drug design and sustainable synthesis. Her research expertise lies in nitrogen substituted organic synthesis, with a focus on their therapeutic applications. She is also proficient in nanofabrication techniques to enhance drug delivery systems as well as in molecular docking studies to predict and optimize drug-target interactions. She has mentored number of M.Phil. and Ph.D. scholars, fostering the growth of future scientists. Her research projects are supported by prestigious grants from PSF and HEC. Her teaching and research reflecting her commitment to advancing in the field of Pharmaceutical Sciences.

Dr. Rubina Siddiqui

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2012**
Email: **rsiddiqui@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2203**

Dr. Rubina Siddiqui is a dedicated academic and researcher, currently serving as an Assistant Professor in the Department of Pharmaceutical Chemistry at the University of Karachi. Teaching is considered a passion for her, with a strong emphasis placed on educating students across various courses. The objective extends beyond knowledge transfer to foster the development of strong character traits in students.

Research efforts have been focused on two primary areas. During M.Phil. studies, interaction studies were conducted on anti-hypertensive drugs with NSAIDs, exploring their binding properties and implications.

In Ph.D. research, a series of complex compounds were synthesized using simple chemicals, showing potential as anti-inflammatory agents. The work involved the design, synthesis, and characterization of these compounds, offering new insights into their therapeutic applications. She has demonstrated outstanding administrative skills in managing departmental activities and developing academic programs, thereby enriching the research and educational environment.

Dr. Urooj Nazim

Designation: **Assistant Professor**
Qualification: **Ph.D. (University of Karachi), M.Phil., Pharm.D. (Baqai Medical University)**
Year of Association: **2012**
Email: **urooj.nazim@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2203**

Dr. Urooj Nazim, is an Assistant Professor in the Department of Pharmaceutical Chemistry at the Faculty of Pharmacy. She received her Pharm.D. and M.Phil. degrees from Baqai Institute of Pharmaceutical Sciences, Baqai Medical University in 2005 and 2010, respectively. She then completed her Ph.D. from the department of Pharmaceutical Chemistry, university of Karachi in 2019 in collaboration with HEJ research institute.

Her teaching expertise spans a broad range of subjects within pharmaceutical chemistry including organic chemistry, physical chemistry and medicinal chemistry. Over 19 years of teaching experience in pharmaceutical chemistry, she has developed and delivered various undergraduate and post graduate courses.

Her research focuses on designing and synthesizing novel pharmaceutical agents and exploring their potential therapeutic applications. She has published various research articles in reputable and high impact factor international and national journals including International Journal of Biochemistry and Cell Biology, Current Problems in Cardiology, Frontiers in oncology, Indian Journal of Pharmaceutical Sciences and Pakistan Journal of Pharmaceutical Sciences.

Board of Studies

Dr. Faiyaz H. M. Vaid
Professor and Chairperson
Department of Pharmaceutical Chemistry
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Dr. Nousheen Mushtaq
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University of Karachi, Karachi

Dr. Sohail Hassan
Professor
Department of Pharmaceutical Chemistry
University of Karachi, Karachi

Dr. Asia Naz
Professor
Department of Pharmaceutical Chemistry
University of Karachi, Karachi

Dr. Safila Naveed
Professor
Department of Pharmaceutical Chemistry
University of Karachi, Karachi

Dr. Rubina Siddiqi
Assistant Professor
Department of Pharmaceutical Chemistry
University of Karachi, Karachi

Dr. Shamim Akhtar
Dean and Professor
Faculty of Pharmacy
Hamdard University, Karachi.

Dr. Fahim Ahmed Siddiqui
Plant Head
Bosch Pharmaceutical (Pvt.) Ltd.
Karachi

Dr. Arfa Akram
Chairperson
Department of Pharmaceutical Chemistry
Federal Urdu University of Arts, Sciences and Technology

Dr. Wajiha Gul
Assistant Professor
Department of Pharmaceutical Chemistry
DOW University of Health Sciences, Karachi.

Pharm. D. Program

First Professional					
1st Semester			**2nd Semester**		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHC - 303	Organic Chemistry	3	PHC - 304	Organic Chemistry (Practical)	3
PHC - 313	Pharmaceutical Mathematics	3	PHC - 306	Pharmaceutical Statistics	3
Second Professional					
PHC - 405	Physical Chemistry - I	3	PHC - 406	Physical Chemistry - I (Practical)	2
-	-	-	PHC - 408	Physical Chemistry - II	3
Third Professional					
PHC - 503	Physical Chemistry - II (Practical)	3	PHC - 506	Preparation And Quality Control (Practical)	3
PHC - 505	Theoretical Basis of Quality Control	3	PHC - 508	Pharmaceutical Analysis - I	3
Fourth Professional					
PHC - 607	Pharmaceutical Analysis - I (Practical)	3	PHC - 608	Pharmaceutical Analysis - II	3
-	-	-	PHC - 610	Medicinal Chemistry - I	3
Fifth Professional					
PHC - 707	Pharmaceutical Analysis - II (Practical)	3	PHC - 710	Medicinal Chemistry - III	3
PHC - 709	Medicinal Chemistry - II	3	-	-	-

Total **17** Courses making **50** Credit Hours in five years

Pharm. D. Courses – Outline
First Semester

Organic Chemistry

PHC-303
Cr. Hrs. 3

1. Introduction to pharmaceutical chemistry, classification and nomenclature of organic pharmaceutical compounds. hyperconjugation, steric effects, inductive effect and mesomeric effect.
2. Nucleophilic and electrophilic substitution reaction in aromatic system. Theory of resonance.
3. Orientation in electrophilic substitution reactions on benzene ring.
4. Organic reactions: Baeyer-Villiger oxidation; Diels Alder reaction; Grignard's reaction, metal hydride reduction and Wolf Krishner reduction, Friedel Craft's reaction, Perkin reaction, Cannizzaro reaction.
5. Carbonium ion rearrangements; Pinacol-pinacolone, Wagner-Merrwein, Wolf, Hofmann and Beckmann rearrangements.
6. Carbanions; condensation reaction (Aldol condensation; Favorskii rearrangment; Wittig reaction).
7. Stereoisomerism, optical isomerism, geometrical isomerism, tautomerism of carbonyl compounds, resolution of racemic mixture and conformational analysis.
8. Free radicals: Introduction, structure and stability.
9. General methods of preparations, properties, identification test and pharmaceutical applications of the following classes and their analogs:
   alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and aniline.

Books Recommended

1. Brown, W. H. (2002). *Introduction to organic chemistry* (3rd ed.). Saunders College Publishing.
2. Silverman, R. B. (1992). *The organic chemistry of drug design and drug action.* Academic Press.
3. Solomons, T. W. G. (1992). *Organic chemistry* (5th ed.). John Wiley & Sons.
4. Sykes, P. (1978). *A guidebook to mechanisms in organic chemistry* (4th ed.). Longman Group Ltd.
5. Wilson, C. O., Gisvold, O., & Doerge, R. F. (Eds.). (1998). *Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry* (10th ed.). Lippincott-Raven Publishers.

Pharmaceutical Mathematics

PHC-313
Cr. Hrs. 3

1. **Algebra**
   Common and natural logarithm, solution of linear and quadratic equations. Equations reducible to quadratic form, solution of simultaneous equations. Arithmetic. Geometric and harmonic progressions. Arithmetic, geometric and harmonic means, permutations and combinations. Binomial Theorem: Simple application.

2. **Trigonometry**
   Measurement of angels in radian and degrees. Definitions of circular functions. Derivation of circular function for simple cases ant trigonometry identities.

3. **Analytical Geometry**
   Coordinates of point in a plane. Distance between two points in a plane. Locus. Equations of straight parallel and perpendicular lines. Equation of parabola, circle and ellipse.

4. **Differential Calculus**
   Limit, concept of derivative. Rules of differentiation, examples on the evaluation of derivatives. Derivatives of algebraic, trigonometric, exponential and logarithmic functions, partial differentiation, higher order derivatives. Maxima and minima points of inflections.

5. **Integral Calculus**
   Concept of integration. Rules of integration. Integrations of algebraic, exponential, logarithmic and trigonometric functions by using different techniques and numerical integration.

Books Recommended

1. Edwards, C. H., & Penney, D. E. (1998). *Calculus with analytic geometry: Early transcendentals version* (5th ed.). Prentice Hall.
2. Bali, N., Gupta, P., & Gandhi, C. (2014). *A textbook of pharmaceutical maths* (2nd ed.). Laxmi Publications.
3. Stewart, J., Clegg, D. K., & Watson, S. (2020). *Calculus: Early transcendentals* (9th ed.). Cengage Learning.
4. Lial, M. L., Hornsby, J., Schneider, D. I., & Daniels, C. J. (2021). *College algebra and trigonometry* (7th ed.). Pearson.
5. Sullivan, M. (2023). *Algebra and trigonometry* (11th ed.). Pearson.

Physical Chemistry-I

PHC-405
Cr. Hrs. 3

1. **Physical Properties and Molecular Constitution**
   Surface and interfacial tension, dielectric constant, dipole moment, refractive index, optical rotation, density, specific gravity, viscosity, molar refraction, parachor.

2. **Colloids and Colloidal System**
   Characteristics features of colloids, type of colloidal system, properties of colloids and colloidal systems. Preparation and purification of colloidal solutions, stability of colloids, pharmaceutical applications.

3. **Solutions**
   Definition types and properties, concentration, solubility and solubilization, factors affecting solubility, solvents used in pharmacy, solutions of electrolytes and non-electrolytes, isotonic solutions, dissolution and dissolution rates, distribution phenomena, theory of distillation, molecular weight determination.

4. **Ionic Equilibria**
   Modern theory of acids, bases and salts, acid-base equilibria, pH and acidity constants, theory of indicators, buffers and buffered system.

5. **Phase Equilibria**
   Phase rule and its applications to one and two component system.

Books Recommended

1. Beckett, A. H., & Stenlake, J. B. (1998). *Practical pharmaceutical chemistry* (4th ed.). Royal Press.
2. Medicines and Healthcare products Regulatory Agency (MHRA). (2025). *British Pharmacopoeia 2025* (Vols. 1–6). The Stationery Office.
3. Martin, A. N. (1993). *Physical pharmacy* (4th ed.). Lea & Febiger.
4. Adejare, A. (Ed.). (2020). Remington: *The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
5. United States Pharmacopeial Convention. (2008). *United States pharmacopeia* 31–NF 26. United States Pharmacopeial Convention, Inc.

Physical Chemistry II (Practical)

PHC-503
Cr. Hrs. 3

1. Conductometric determination of the ionization constant of a weak acid.
2. Conductometric determination of the solubility of sparingly soluble salt.
3. U. V. absorption spectra of aromatic compounds and geometric isomers.
4. Determination of the wavelength of maximum absorbance and molar extinction coefficient of a given sample.
5. Determination of the first-order rate constant for acid catalyzed hydrolysis of a given sample.
6. Determination of the first-order rate constant for the decomposition of a given sample.
7. Determination of effect of change of temperature in the rate of reaction.

8. To study the stability of a drug subjected to various stress conditions
9. Determination of heat of neutralization of HCl and NaOH.
10. Determination of heat of vapourization / transition of a given sample.
11. Determination of heat of solution from solubility.
12. Determination of an equilibrium constant by distribution method.

Books Recommended

1. Barrow, G. M. (1973). *Physical chemistry* (3rd ed.). McGraw-Hill.
2. Fazal, I. H. (1991). *Physical chemistry* (3rd ed.).
3. Glasstone, S. (1946). *Textbook of physical chemistry* (2nd ed.). Macmillan & Company Ltd.
4. Higuchi, T., & Brochmann-Hanssen, E. (Eds.). (1961). *Pharmaceutical analysis*. Interscience.

Theoretical Basis of Quality Control

PHC-505
Cr. Hrs. 3

1. Pharmaceutical chemistry and its relation to other sciences.
2. Brief historical outline.
3. Raw material for drugs
4. Sources of impurities in pharmaceuticals.
5. Purity and its control.
6. Testing and determination of water.
7. Survey of analytical methods
8. Quantitative and qualitative analysis (general information)
9. Pharmacopeial tests and specifications.
10. Standardization of pharmaceuticals and formulated products.
11. Quality control system for drugs and pharmaceuticals
12. Causes of poor quality and general requirements.
13. Total quality management, a new approach.
14. Sampling techniques, validation and statistical treatment of analytical data.

Books Recommended

1. Pott, L. W. (1987). *Quantitative analysis: Theory and practice*. Harper & Row Publishers.
2. Watson, D. G. (1999). *Pharmaceutical analysis: A textbook for pharmacy students and pharmaceutical chemists*. Churchill Livingstone.
3. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
4. Convention. (2008). *United States Pharmacopeia 31–NF 26*. United States Pharmacopeial Convention, Inc.
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2006). *Vogel's textbook of practical organic chemistry* (6th ed.). Longman

Pharmaceutical Analysis – I (Practical)

PHC-607
Cr. Hrs. 3

1. **Assay of pharmaceutical compounds based on chemical methods**
   Acid base titration, oxidation-reduction titration, complexometric titration, gravimetric, solvent extraction, and gasometric methods.
   Potentiometric determination.
   pH of a solution and titration of an acid.
   Strength of unknown solution of HCl with NaOH.
   Strength of each acid in a mixture of HCl and CH3COOH using standard alkali.
   Conductometric determination.
   Equivalent point of titration of HCl with NaOH.

2. **Polarographic determination**
   Amount of nitrobenzene in solutions.
   Quinhydrone.

3. **Determination of refractive index of liquids by Abbe-refractometer.**
   Determination of the composition of unknown mixture of two liquids.
   Determination of the concentration of alcohol in solutions.
   Determination of a 10% solution of calcium chloride.

4. **Polarimetric determination of:**
   Concentration of sugar in a given solution.
   Percentage of two optically active substances in a given solution.

5. **Fluorometric determination of a standard drug in a given sample.**

Books Recommended

1. Beckett, A. H., & Stenlake, J. B. (1998). *Practical pharmaceutical chemistry* (4th ed.). Royal Press.
2. Medicines and Healthcare products Regulatory Agency (MHRA). (2025). *British Pharmacopoeia 2025* (Vols. 1–6). The Stationery Office.
3. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2006). *Vogel's textbook of quantitative inorganic analysis:* Including elementary instrumental analysis (6th ed.). Longman.
4. Pott, L. W. (1987). *Quantitative analysis: Theory and practice*. Harper & Row Publishers.
5. United States Pharmacopeial Convention. (2008). *United States Pharmacopeia 31–NF 26*. United States Pharmacopeial Convention, Inc.

Pharmaceutical Analysis – II (Practical)

PHC-707
Cr. Hrs. 3

1. Assay of pharmaceutical compounds based on spectrophotometric methods.
2. Separation, identification and quantitation of a drug substance by chromatographic methods such as TLC, GLC, HPLC.
3. To study the methods development procedure of a drug substance by UV-Visible spectroscopy/TLC/GLC/HPLC.
4. To study the experimental methodology of validation of a drug substance by UV-Visible spectroscopy/TLC/GLC/HPLC.

Books Recommended

1. Medicines and Healthcare products Regulatory Agency (MHRA). (2025). *British Pharmacopoeia 2025* (Vols. 1–6). The Stationery Office.
2. Ewing, G. W. (1985). *Instrumental methods of chemical analysis* (5th ed.). McGraw-Hill.
3. Skoog, D. A., Holler, F. J., & Nieman, T. A. (2000). *Principles of instrumental analysis* (5th ed.). Brooks/Cole.
4. United States Pharmacopeial Convention. (2008). *United States Pharmacopeia 31–NF 26*. United States Pharmacopeial Convention, Inc.
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2006). *Vogel's textbook of quantitative organic analysis* (6th ed.). Longman.

Medicinal Chemistry-II

PHC-709
Cr. Hrs. 3

To study the chemistry, structure, mechanism of action, structure activity relationship and therapeutic applications of the following:

1. **Analgesic and Antipyretics**
   Paracetamol, salicylic acid analogues, quinolines derivatives pyrazalone and pyrazolidines, N-aryl anthranilic acids, aryl and heteroaryl acetic acid derivatives.

2. **Local Anesthetics**
   Benzoic acid derivatives, lidocaine derivatives (anilids), amino benzoic acid, miscellaneous compounds such as: Procaine, lignocaine, eucaine, cocaine and benzocaine.

3. **Central Nervous System Depressants**
   General anesthetics, inhalation anesthetics, ultrashort acting barbiturates, dissociative anesthetics such as cyclopropane, halothane, nitrous oxide, chloroform, thiopental sodium, ketamine, methohexital, thiamylal sodium, fentanyl citrate, tribromo ethanol.
   Anxiolytics, sedative, hypnotics, such as benzodiazepines, barbiturates, paraldehyde, glutethimide, chloral hydrate and alcohols.
   Anti-convulsant such as barbiturates, hydantoins, oxazolidinediones, succinimides, benzodiazepines.
   Antipsychotics, such as phenothiazines, fluor butyrophenones, β-aminoketones, CNS depressants with skeletal muscle relaxant properties.

4. **Central Nervous System Stimulants**
   Tricyclic antidepressants, monoamine oxidase inhibitors, analeptics, picrotoxin, methylxanthines, Indole ethyl amines, 2-phenylehylamines.

5. **Diuretics**
   Site-1, site-2, site-3 and site 4 diuretics, like acetazolamide, high ceiling or loop diuretics, potassium sparing diuretics, mercaptomerin, meralluride, ethacrynic acid, thiazide and thiazide like diuretics, spironolactone, triamterene etc.

6. **Antiviral agents such as acyclovir, tromantadine hydrochloride, ribavirin**

7. **Immunosuppressive agents such as azathioprine, cyclosporine**

8. **Anti-Neoplastic Agents**
   Alkylating agents, antimetabolites, antibiotics, plant products, miscellaneous compounds, hormones, immunotherapy, such as methotrexate, 5-fluorouracil, actinomycins, anthracyclines, vincristine, tamoxifen.

9. **Anti-Histamines**
   H1-antagonists, H2-antagonists, aminoalkyl ethers, ethylenediamines, propylamine derivatives, phenothiazine derivatives, piperazine derivatives, such as diphenhydramine, pyrilamine, promethazine, cyclizine, terfenadine, cimetidine, ranitidine.

Books Recommended

1. Foye, W. O., Lemke, T. L., & Williams, D. A. (2013). *Foye's principles of medicinal chemistry* (7th ed.). Wolters Kluwer Health / Lippincott Williams & Wilkins.
2. Wilson, C. O., Gisvold, O., & Doerge, R. F. (2011). *Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry* (12th ed.). Wolters Kluwer Health / Lippincott Williams & Wilkins.
3. Gringauz, A. (1997). *Introduction to medicinal chemistry: How drugs act and why.* John Wiley & Sons, Inc.
4. Silverman, R. B. (1992). *The organic chemistry of drug design and drug action*. Academic Press.
5. Wolf, M. E. (Ed.). (2003). *Burger's medicinal chemistry and drug discovery* (6th ed.). Wiley-Interscience.

Second Semester

Organic and Inorganic Chemistry (Practical)

PHC-304
Cr. Hrs. 3

1. Identification of unknown simple organic compounds containing acidic, basic and neutral functional groups.

2. Estimation of functional groups in the following drugs:
   Sulfa drugs, aspirin, paracetamol, benzyl penicillin, bromisoval, methenamine.

3. Determination of iodine and saponification value, and ash content.

4. Preparation of some organic and inorganic compounds:
   Acetanilide, iodoform, nitrophenol, 3-nitrophthalic acid, benzhydryl, 2, 4-dinitro-chlorbenzene, ferrous sulfate, aluminum hydroxide, magnesium carbonate, sodium carbonate.

Books Recommended

1. Beckett, A. H., & Stenlake, J. B. (1998). *Practical pharmaceutical chemistry* (4th ed.). Royal Press.
2. Brown, W. H. (2002). *Introduction to organic chemistry* (3rd ed.). Saunders College Publishing.
3. Solomons, T. W. G. (1992). *Organic chemistry* (5th ed.). John Wiley & Sons, Inc.
4. Sykes, P. (1978). *A guidebook to mechanisms in organic chemistry* (4th ed.). Longman Group Ltd.
5. Watson, D. G. (1999). *Pharmaceutical analysis: A textbook for pharmacy students and pharmaceutical chemists*. Churchill Livingston.

Pharmaceutical Statistics

PHC-306
Cr. Hrs. 3

1. What is statistics? Importance's of statistics. What is biostatistics? Application of statistics in biological and pharmaceutical sciences. How samples are selected.
2. Organizing and displaying data: Variables, quantitative and qualitative variables, univariate data, bivariate data. frequency table, diagrams, pictograms, simple bar charts, multiple bar charts, histograms.
3. Summarizing data and variation: The mean, the median, the mode, the variance and standard deviation, coefficient of variation and skewness.
4. Probability: Definitions of probability, rules of probability. Distributions (binomial, poisson, and normal probability distributions).
5. Test of hypothesis and significance: Statistical hypothesis, level of significance, test of significance. Confidence intervals. Test involving binomial and normal distributions. Student "t" and Chi-square distribution test of significance based on "t" and chi square distributions.
6. Curve Fitting: Fitting a straight line, fitting of parabolic or high degree curve.
7. Regression and correlation: simple linear regression model. Correlation co-efficient.
8. Analysis of variance: One-way classification, partitioning of sum of squares and degrees of freedom. Multiple compression tests such as LSD. The analysis of variance models.

Books Recommended

1. Triola, M. F., Triola, J., & Roy, J. (2024). *Biostatistics for the Biological and Health Sciences* (3rd ed., Global Ed.). Pearson.
2. Rossi, R. J. (2022). *Applied Biostatistics for the Health Sciences* (2nd ed.). Wiley.
3. Daniel, W. W., & Cross, C. L. (2018). *Biostatistics: A Foundation for Analysis in the Health Sciences* (11th ed.). Wiley.
4. Buncher, C. R. (Ed.), & Tsay, J.-Y. (Ed.). (2005). *Statistics in the Pharmaceutical Industry* (3rd ed.). Chapman & Hall/CRC Biostatistics Series.
5. Walpole, R. E. (1990). *Introduction to statistics* (3rd ed.). Macmillan Publishing Company.

Physical Chemistry – I (Practical)

PHC-406
Cr. Hrs. 2

1. Determination of specific gravity of liquids/syrups using an Ostwald pycnometer.
2. Determination of the viscosity of a liquid by Ostwald viscometer.
3. Determination of the percent composition of a mixture of ethanol and water by viscometry method.
4. Determination of the parachor value of an organic liquid.
5. Determination of the surface tension of a pure liquid by the drop count method.
6. Determination of the percentage composition of mixture of ethanol and water by surface tension method.
7. Determination of interfacial tension between benzene and water by the drop count method.
8. Determination of solubility of benzoic acid over a range of temperatures and calculation of its heat of solution.
9. Determination of the mutual solubility curve of phenol and water.
10. Preparation of buffer solutions and measurement of pH.
11. Determination of variation of miscibility with temperature.
12. Determination of the partition coefficient of I2 between CCl4 and H2O.

Books Recommended

1. Barrow, G. M. (1973). *Physical chemistry* (3rd ed.). McGraw-Hill.
2. Fazal, I. H. (1991). *Physical chemistry* (3rd ed.).

3. Glasstone, S. (1946). *Textbook of physical chemistry* (2nd ed.). Macmillan & Company Ltd.
4. Higuchi, T., & Brochmann-Hanssen, E. (Eds.). (1961). *Pharmaceutical analysis*. Interscience (Wiley).

Physical Chemistry – II

PHC-408
Cr. Hrs. 3

1. **Electrochemistry**
   Definition, resistance, conductance, specific conductance, conductivity and its measurement, conductometric titrations, electrochemical cells, determination of pH and redox potentials, electrophoresis and electrodialysis.

2. **Photochemistry**
   Definition light absorption and excitation of organic compounds, photophysical and photochemical processes, photochemical reactions, photosensitization and photocatalysis, photolysis of medicinal compounds and photo stabilization, high energy radiations.

3. **Solid and Crystalline State**
   Formation of solids, types of solids, nature of amorphous and crystalline solids, crystal systems, determination of crystal structure, polymorphism.

4. **Chemical Kinetics**
   Rates and order of reactions, influence of temperature and other factors on reaction rates, acid-base catalysis, decomposition of medicinal compounds, accelerated stability analysis, kinetics of enzyme catalyzed reactions.

5. **Thermodynamics**
   First and second law of thermodynamics, thermochemistry, relationship between free energy, entropy and equilibrium constant, free energy functions and applications.

Books Recommended

1. Atkins, P. W. (2000). *Physical chemistry* (5th ed.). W. H. Freeman and Company.
2. Beckett, A. H., & Stenlake, J. B. (1998). *Practical pharmaceutical chemistry* (4th ed.). Royal Press.
3. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
4. Martin, A. N. (1993). *Physical pharmacy: Physical chemical principles in the pharmaceutical sciences* (4th ed.). Lea & Febiger.

Preparation and Quality Control (Practical)

PHC-506
Cr. Hrs. 3

1. Preparation/synthesis, identification and purity determination of the following important pharmaceutical compounds as mentioned in B. P and U. S. P.
   Paracetamol, salicylic acid, methyl salicylate, azobenzene, benzoic acid.5-Hydroxy-1, 3-benzoxazol-2-one, aspirin, *p*-nitroso phenol, 3-nitrophthalic acid, *o*-Chlorobenzoic acid.
2. Limit tests as mentioned in pharmacopoeias for lead, arsenic, chlorides, sulphates, iron and heavy metals.

Books Recommended

1. Brown, W. H. (2002). *Introduction to organic chemistry* (3rd ed.). Saunders College Publishing.
2. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
3. Greaser, C. S., & Davies, A. M. C. (1988). *Analytical applications of spectroscopy.* Royal Society of Chemistry.
4. Mushtaq, N., & Akhtar, S. (2006). *Laboratory techniques and organic preparations* (Manual for PHC 506), BCC&T.
5. Sykes, P. (1978). *A guidebook to mechanisms in organic chemistry* (4th ed.). Longman Group Ltd.

Pharmaceutical Analysis - I

PHC-508
Cr. Hrs. 3

To study the principles and applications of the following methods in the drug analysis and development

1. **Chemical Methods**
   Titrimetric methods, Gravimetric methods, Solvent extractions methods.

2. **Electro Chemical Methods**
   Potentiometry, Polarography, Conductometry.

3. **Optical Methods**
   Refractometry, Polarimetry, Fluorimetry.

4. **Radiochemical Methods**
   Introduction to Radiopharmaceuticals, Analysis, Quality Control, Stability, Applications.

Books Recommended

1. Ewing, G. W. (1985). *Instrumental methods of chemical analysis* (5th ed.). McGraw-Hill.
2. Pott, L. W. (1987). *Quantitative analysis:* Theory and practice. Harper & Row Publishers.
3. Skoog, D. A., Holler, F. J., & Nieman, T. A. (2000). *Principles of instrumental analysis* (5th ed.). Harcourt Brace College Publishers.
4. Vogel, A. I. (2006). *Vogel's textbook of quantitative organic analysis* (6th ed.). Longman Scientific & Technical.
5. Watson, D. G. (1999). *Pharmaceutical analysis: A textbook for pharmacy students and pharmaceutical chemists*. Churchill Livingstone.

Pharmaceutical Analysis – II

PHC-608
Cr. Hrs. 3

To study the principles and applications of the following methods in the drug analysis and development

1. **Spectroscopic Methods**
   Spectrophotometry (UV, Visible and Infrared), atomic absorption spectroscopy, mass spectrometry, nuclear magnetic resonance spectrometry, x-ray spectroscopy.

2. **Chromatographic Methods**
   Thin layer chromatography, column chromatography, gas-liquid chromatography, high performance liquid chromatography, ion-exchange chromatography, size exclusion or gel chromatography.

Books Recommended

1. Skoog, D. A., Holler, F. J., & Nieman, T. A. (2000). *Principles of instrumental analysis* (5th ed.). Brooks/Cole.
2. Stock, R., & Rice, C. B. E. (1966). *Chromatographic methods* (2nd ed.). Chapman and Hall.
3. Ewing, G. W. (1985). *Instrumental methods of chemical analysis* (5th ed.). McGraw-Hill.
4. Stuart, B. (1996). *Modern infrared spectroscopy*. John Wiley & Sons.
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2006). *Vogel's textbook of practical organic chemistry* (6th ed.). Pearson Education Ltd.

Medicinal Chemistry- I

PHC-610
Cr. Hrs. 3

1. **Introduction to medicinal chemistry.**

2. **Classification of drugs** based on sources, structure, site of action and mode of action.

3. **Preparation and properties of medicinally important heterocyclic compounds** such as: pyrrol, furan, thiophene, pyridine, pyrimidine and pyrazine. Five and six membered rings containing one heteroatom: indole, quinoline and Isoquinoline.

4. **Drug Discovery and development: Lead finding and modification**

5. **Introduction and types of drug targets**

6. **Structure activity relationship**

7. **Alkaloids** – atropine, morphine and related compounds (codeine, thebaine), ergotamine, reserpine, ephedrine.

8. **Hormones** (steroidal and proteinious): Testosterone, progesterone, estrogen, aldosterone, cortisol, insulin, glucagon, oxytocin and vasopressin.

9. **Pharmacodynamic features and drug development**
   Stereochemistry and drug action
   Forces involved in drug receptor interaction
   Drug Receptor interaction; Theories

10. **Pharmacokinetic features and drug development**
    Absorption: pH partition theory
    Metabolism of Drug
    - Introduction
    - Reactions involved in Phae-I and Phase-II

11. **Modern concepts in medicinal chemistry**
    Computational Chemistry
    Combinatorial Chemistry
    Biotechnology and drug discovery

Books Recommended

1. Patrick, G. L. (2000). A*n introduction to medicinal chemistry* (2nd ed.). Oxford University Press.
2. Foye, W. O., Lemke, T. L., & Williams, D. A. (2013). *Foye's principles of medicinal chemistry* (7th ed.). Lippincott Williams & Wilkins.
3. Wilson, C. O., Gisvold, O., & Doerge, R. F. (2011). *Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry* (12th ed.). Lippincott Williams & Wilkins.
4. Gringauz, A. (1997). *Introduction to medicinal chemistry: How drugs act and why.* John Wiley & Sons.
5. Brown, W. H. (2001). *Introduction to organic chemistry* (3rd ed.). Saunders College Publishing.
6. Silverman, R. B. (1992). *The organic chemistry of drug design and drug action.* Academic Press.

Medicinal Chemistry –III

PHC-710
Cr. Hrs. 3

To study the chemistry, structure, mechanism of action, structure activity relationship and therapeutic applications of the following

1. **Antibacterial / Antibiotics**
   Sulphonamides such as sulfamethoxazole, sulfadiazine, sulfafurazole. Penicillin, Cephalosporine, Streptomycin, Chloramphenicol, Tetracyclines, Kanamycin and Erythromycin.

2. **Antimalarial agents** such as 4-aminoquinolines, 8-aminoquinolines, 9-amino acridine, biguanides, pyrimidine, analogues, mefloquine, cinchona alkaloids.

3. **Anthelmintics such** as piperazine derivatives, thiabendazole, mebendazole, pyrantel.

4. **Antitubercular drugs** such as ethambutol, isonicotinic acid, hydrazide rifampicin, pyrazinamide, cycloserine,

ethambutol, ethionamide, streptomycin, kanamycin, para aminobenzoic acid, rifamycin, fluoroquinolones.

5. **Hypoglycemic agents** such as sulfonylureas tolbutamide, chlorpropamide, acetohexamide, glipizide, glyburide.

6. **Cardiovascular agents:** Antianginal agents and vasodilators, antiarrhythmic drugs, antihypertensive agents, angiotensin-converting enzymes inhibitors, antihyperlipidemic agents, anticoagulants.

7. **Adrenergic and cholinergic agents, neurotransmitters, receptors, agonists and antagonists**

8. **Vitamins** (water and fat soluble). B_1, B_2, B_6, B_{12}, folic acid, nicotinic acid, biotin, pantothenic acid, ascorbic acid A, D, E and K.

To study the Occurrence, properties, preparation and applications of the following medicinally active inorganic compounds.

Aluminum Hydroxide, Ammonium Chloride, Sodium Carbonate, Magnesium Carbonate, Lithium Carbonate, Sodium Nitrite, Calcium Gluconate, Ferrous Fumarate, Ferrous Sulfate and Silver nitrate.

Books Recommended

1. Foye, W. O., Lemke, T. L., & Williams, D. A. (2013). *Foye's principles of medicinal chemistry* (7th ed.). Wolters Kluwer / Lippincott Williams & Wilkins.
2. Wilson, C. O., Gisvold, O., & Doerge, R. F. (2011). *Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry* (12th ed.). Wolters Kluwer / Lippincott Williams & Wilkins.
3. Gringauz, A. (1997). *Introduction to medicinal chemistry: How drugs act and why.* John Wiley & Sons.
4. Wolff, M. E. (Ed.). (2003). *Burger's medicinal chemistry and drug discovery* (6th ed.). Wiley-Interscience.
5. Silverman, R. B. (1992). *The organic chemistry of drug design and drug action.* Academic Press.

Courses Schedule
Pharm. D. (Deficiency) Program

1st Semester			2nd Semester		
Course N0.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHC - 303(D)	Pharmaceutical Chemistry (Organic and Inorganic)	2	PHC - 406(D)	Physical Chemistry (Lab)	2
PHC - 505(D)	Theoretical Basis of Quality Control	2	PHC -710(D)	Medicinal Chemistry	3
PHC - 707(D)	Pharmaceutical Analysis	2	-	-	-
Total **5** Courses making **11** Credit Hours in one year					

Pharm. D. Deficiency Courses - Outline
First Semester

Pharmaceutical Chemistry (Organic and Inorganic)

PHC-303 (D)
Cr. Hrs. 2

1. **Organic reactions:** Baeyer-Villiger oxidation; Diels Alder reaction; Grignard's reaction, metal hydride reduction and Wolff Krishner reduction, Friedel Craft's reaction, Perkin reaction, Cannizzaro reaction.

2. **Carbonium ion rearrangements:** Pinacol-pinacolone, Wagner-Meerwein, Wolf, Hofmann and Beckmann rearrangements.

3. **Carbanions:** condensation reaction (Aldol condensation; Favorskii rearrangement; Wittig reaction).

4. **Inorganic Drugs**
   Occurrence, preparation, physical characteristics, chemical properties, purity test, incompatibilities, assay and pharmaceutical uses of inorganic drugs such as:

   Aluminum hydroxide
   Sodium carbonate
   Sodium thiosulphate
   Magnesium carbonate
   Ammonium chloride
   Sodium chloride
   Sodium tetraborate (borax)
   Potassium chloride

Lithium carbonate	Sodium nitrite
Calcium gluconate	Calcium carbonate
Calcium chloride	Calcium lactate
Ferrous fumarate	Ferrous sulfate
Ferrous gluconate	Iron polysaccharide
Silver nitrate	Antimony gluconate
Iodine	Hydrogen per oxide
Boric acid	Zinc oxide

Books Recommended

1. Sykes, P. (1978). *A guidebook to mechanisms in organic chemistry* (4th ed.). Longman Group Ltd.
2. Solomons, T. W. G. (1992). *Organic chemistry* (5th ed.). John Wiley & Sons, Inc.
3. Adejare, A. (Ed.). (2020). Remington: *The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0
4. *Vogel's textbook of quantitative inorganic analysis:* Including elementary instrumental analysis (6th ed.). Longman.
5. Parkes, G. D. (1956). *Mellor's modern inorganic chemistry.* Longman Green & Co.

Theoretical Basis of Quality Control

PHC-505 (D)
Cr. Hrs. 2

1. Pharmaceutical sciences and its relation to other sciences.
2. Brief historical outline.
3. Raw material for drugs.
4. Sources of impurities in pharmaceuticals.
5. Quantitative and qualitative analysis (general information).
6. Standardization of pharmaceuticals and formulated products.
7. Quality control system for drugs and pharmaceuticals.
8. Causes of poor quality and general requirements.
9. Total quality management, a new approach.
10. Validation methodology and statistical treatment of analytical data.

Books Recommended

1. Watson, D. G. (1999). *Pharmaceutical analysis: A textbook for pharmacy students and pharmaceutical chemists*. Churchill Livingstone.
2. Pott, L. W. (1987). *Quantitative analysis: Theory and practice*. Harper & Row Publishers.
3. Adejare, A. (Ed.). (2020). *Remington: The science and practice of pharmacy* (23rd ed.). Academic Press. https://doi.org/10.1016/C2018-0-02594-0.
4. United States Pharmacopeial Convention. (2008). *United States Pharmacopeia 31–National Formulary 26* (USP 31–NF 26). United States Pharmacopeial Convention, Inc.
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2006). *Vogel's textbook of practical organic chemistry* (6th ed.). Longman.

Pharmaceutical Analysis

PHC-707 (D)
Cr. Hrs. 2

To study the principles and applications of spectroscopic and chromatographic method with special reference to

1. Assay of pharmaceutical compounds.
2. Separation, identification and quantitation of a drug.
3. Method, development procedure of a drug.
4. Experimental methodology of validation of a drug.

Books Recommended

1. Medicines and Healthcare products Regulatory Agency (MHRA). (2025). *British Pharmacopoeia 2025* (Vols. 1–6). The Stationery Office.

2. Ewing, G. W. (1985). *Instrumental methods of chemical analysis* (5th ed.). McGraw-Hill.
3. Skoog, D. A., Holler, F. J., & Nieman, T. A. (2000). *Principles of instrumental analysis* (5th ed.). Brooks/Cole.
4. United States Pharmacopeial Convention. (2008). *United States Pharmacopeia 31–National Formulary 26* (USP 31–NF 26). United States Pharmacopeial Convention, Inc.
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2006). *Vogel's textbook of practical organic chemistry* (6th ed.). Longman.

Physical Chemistry (Lab.)

PHC-406 (D)
Cr. Hrs. 2

1. Distillation of a mixture.
2. Distillation of an azeotropic mixture with minimum/maximum boiling point.
3. Determination of variation of miscibility with temperature.
4. Absorption curve of an indicator as a function of pH.
5. Composition of a complexion in solution.
6. Determination of molar refraction of a solid substance by dissolving it in a solvent.
7. Molecular weight determination.
8. Determination of the first-order rate constant for acid catalyzed hydrolysis of a given sample.
9. Determination of the first-order rate constant for the decomposition of a given sample.
10. Determination of effect of change of temperature in the rate of reaction.
11. To study the stability of a drug subjected to various stress conditions.
12. Determination of heat of solutions from solubility.

Books Recommended

1. Higuchi, T., & Brochmann-Hanssen, E. (Eds.). (1961). *Pharmaceutical analysis*. Interscience (Wiley).)
2. Barrow, G. M. (1973). *Physical chemistry* (3rd ed.). McGraw-Hill.
3. Hussain, F. I. (1991). *Physical chemistry* (3rd ed.).
4. Glasstone, S. (1946). *Textbook of physical chemistry* (2nd ed.). Macmillan & Company Ltd.

Medicinal Chemistry

PHC-710 (D)
Cr. Hrs. 3

1. **DNA recombinant technology/genetic engineering (with reference to drug designing).**

2. **To study the chemistry, structure, mechanism of action, structure activity relationship and therapeutic applications of the following.**
   a. Hypoglycemic agents such as sulfonylureas tolbutamide, chlorpropamide, acetohexamide, glipizide, glyburide.
   b. Antibiotics such as penicillin, cephalosporins, streptomycin, chloramphenicol, tetracyclines, kanamycin and erythromycin.
   c. Antimalarial agents such as 4-aminoquinolines, 8-aminoquinolines, 9-amino acridines, biguanides, pyrimidine, analogues, mefloquine, cinchona alkaloids.
   d. Anthelmintics such as piperazine derivatives, thiabendazole, medendazole, pyrantal.
   e. Antiviral agents such as acyclovir, tromantadine hydrochloride, ribavirin.
   f. Immunosuppressive agents such as azathioprine, cyclosporine.

3. **To study the biosynthesis, drug designing and action of the following:**
   a. Autocoids such as prostaglandins, leukotrienes and eicosanoids.
   b. Adrenergic and cholinergic agents, neurotransmitters, receptors, agonists and antagonists.

Books Recommended

1. Foye, W. O., Lemke, T. L., & Williams, D. A. (2008). *Foye's principles of medicinal chemistry* (6th ed.). Lippincott Williams & Wilkins.
2. Wilson, C. O., Gisvold, O., & Doerge, R. F. (1998). *Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry* (12th ed.). Lippincott-Raven Publishers.

3. Wolff, M. E. (Ed.). (2003). B*urger's medicinal chemistry and drug discovery* (6th ed.). Wiley-Interscience.
4. Gringauz, A. (1997). *Introduction to medicinal chemistry: How drugs act and why.* Wiley-VCH.
5. Silverman, R. B. (1992). *The organic chemistry of drug design and drug action*. Academic Press.

Faculty of **Pharmacy and Pharmaceutical Sciences**

Department of Pharmacology

Message from the Chairperson

As we introduce our new Pharmacy catalog, I am thrilled to invite you to explore the vast array of academic programs and research opportunities offered by the Department of Pharmacology.

Our department is committed to fostering a culture of excellence, innovation, and collaboration. Our faculty members are expert in their fields, and our department provides an ideal environment for learning and research.

This catalogue provides a comprehensive overview of our undergraduate program, including course descriptions, research areas and faculty profiles.

I encourage you to browse through this catalogue and discover the exciting disciplines of Pharmacology subject.

Best regards

Prof. Dr. Afshan Siddiq

Department of **Pharmacology**

The Department of Pharmacology is one of the important Departments of the Faculty of Pharmacy and Pharmaceutical Sciences since 1973, not only sharing a major load at the under graduate level but also preparing students to fill the gap by suitably qualified manpower in the field of pharmacy at post graduate levels. The expansion of the department and graduate programs in the areas of modern pharmacology including Neuropharmacology, Toxicology and Biochemical Pharmacology is expected to place the department among high research ranking Departments of the University.

The major academic objectives of the Department are to facilitate basic and applied research, educate under graduate, graduate and professional students in various disciplines and provide academic excellence. Department of Pharmacology has so far produced a great number of Ph.Ds. in the Faculty of Pharmacy and Pharmaceutical Sciences and a large number of M.Phil. and M.Pharm. The Department is composed of highly competent primary faculty, research faculty and technical support staff.

Contact Details

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Email: pharmacology@uok.edu.pk
Website: https://www.uok.edu.pk/faculties/pharmacology/index.php

Vision and Mission Statement

• Vision

The Department of Pharmacology at Karachi University's Faculty of Pharmacy and Pharmaceutical sciences envisions becoming a premier research-driven academic hub, fostering excellence in pharmacological sciences. We strive to educate and inspire future pharmacologists, empowering them to deliver compassionate patient care and contribute meaningfully to society.

• Mission

The Department of Pharmacology is committed to:

- Providing high-quality undergraduate education and training in pharmacology
- Conducting innovative research that advances pharmacological sciences and improves human health
- Fostering a culture of academic excellence, critical thinking, and lifelong learning
- Developing competent pharmacologists who can provide optimal patient care
- Serving the community through outreach, education, and collaborative research initiatives.

Group Photo of the Department

Sitting, from L to R: Dr. Nuzhat Sultana, Prof. Dr. Syeda Afroz, Prof. Dr. Afshan Siddiq, Dr. Sadia Ghousia Baig, Dr. Azra Riaz

Standing, from L to R: Dr. Shadab Ahmed, Dr. Sana Sarfaraz, Dr. Adnan Iqbal

Dr. Afshan Siddiq

Designation: **Chairperson & Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
Email: **afshan@uok.edu.pk | afshanpharma@gmail.com**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Prof. Dr. Afshan Siddiq, as a Distinguished Professor and Chairperson at the University of Karachi, has established herself as a leading figure in pharmacological education and research. With a strong academic foundation, including a Ph.D., M.Phil., and B.Pharm. from the University of Karachi, Dr. Siddiq has been an integral part of the institution since 2006. Her research expertise spans Systemic Pharmacology, Biochemistry, and Toxicology, with a particular focus on Biochemical Pharmacology. Dr. Siddiq's publication record showcases her contributions to various areas of pharmacology, including antipsychotic efficacy, anticancer agents, and periodontal disease progression in diabetic patients. As an accomplished academic, Dr. Siddiq has held key leadership positions, including membership in departmental and university-wide committees, such as the Departmental Research Committee and departmental Ethical Committee, Member of Hungarian Society for Experimental and Clinical Pharmacology, and Member Affiliation committee UOK etc. Her editorial roles include Associate Editor for the Journal of Applied and Basic Sciences and Associate Editorial Board Member for The Open Pharmacology Journal, and Editorial Board Member for the Pakistan Journal of Pharmaceutical Sciences. Throughout her tenure, Dr. Siddiq has consistently demonstrated a commitment to academic excellence, research innovation, and institutional leadership, solidifying her reputation as a prominent figure in the field of Pharmacology.

Dr. Syeda Afroz

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
Email: **safroz@uok.edu.pk | ayaz_london@yahoo.com**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Dr. Syeda Afroz is a respected Professor at the University of Karachi, where she has been a dedicated member of the faculty since 2006. Her strong academic foundation includes a Ph.D., M.Phil., and B.Pharm., all earned from the University of Karachi, underscoring her profound connection to the institution. Dr. Afroz's primary area of interest and teaching expertise lies in General Pharmacology, providing a comprehensive understanding of drug actions and their effects. Her research endeavors are particularly concentrated in the specialized field of Neuropharmacology, focusing on the intricate interactions of drugs with the nervous system. Her long-standing tenure at the University of Karachi since 2006 signifies a career devoted to advancing pharmacological knowledge and contributing to the academic community. Her commitment ensures the continued education of future pharmacists and researchers in critical areas of pharmacology.

Dr. Azra Riaz

Designation: **Associate Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2012**
Email: **azra.wasif@uok.edu.pk | riazazra797@gmail.com**
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Dr. Azra Riaz is an accomplished Associate Professor at the Department of Pharmacology, Faculty of Pharmacy & Pharmaceutical Sciences, University of Karachi, with a deep-rooted academic connection to the institution where she earned her Ph.D., M.Phil., and B.Pharm. Joining the faculty in 2012, Dr. Riaz has since been a vital contributor to the university's academic and research landscape.

Her teaching and research interests are notably diverse, encompassing Pharmacology, Physiology, and Pathology providing a holistic approach to the field of Pharmacology. Dr. Riaz's research endeavors are particularly broad and impactful, focusing on critical areas such as biochemical and hematological parameters, coagulation, inflammation, and neuropharmacology. This wide range of research interests underscores her versatile expertise and commitment to exploring complex biological processes and their pharmacological implications. Her significant tenure since 2012 and her varied research focus highlight a dedicated and productive career aimed at advancing scientific knowledge and contributing to the education of future professionals in the field of Pharmacology.

Dr. Saira Saeed Khan

Designation: **Associate Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2012**
Email: **saira.khan@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Dr. Saira Saeed Khan is a highly esteemed Associate Professor within the Department of Pharmacology at the University of Karachi. A proud alumna of the institution, Dr. Khan completed all her higher education there, earning her B.Pharm., M.Phil, and Ph.D. This deep-rooted connection to the University of Karachi began in 2012 when she joined the Department of Pharmacology, and since then, she has been an invaluable asset, significantly contributing to both pharmacology education and research.

Dr. Khan's research is both diverse and impactful, with a particular focus on neuropharmacology and neurodegenerative diseases. Her expertise also extends to endocrinological disorders, specifically diabetes and Polycystic Ovary Syndrome (PCOS), addressing critical health challenges through her dedicated work.

In a testament to her academic excellence and research prowess, Dr. Khan was awarded the prestigious Fulbright scholarship in 2024. This enabled her to complete a Post-doctorate in Pharmacology at the University of Toledo, Ohio, USA. This invaluable international experience has undoubtedly broadened her perspectives, further enriching her commitment to advancing scientific knowledge and fostering academic excellence within her field.

Dr. Shadab Ahmed

Designation: **Associate Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2012**
Email: **a_shadab@uok.edu.pk | a_shadab@hotmail.com**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Dr. Shadab Ahmed is a highly respected Associate Professor at the University of Karachi, where he has consistently demonstrated exceptional loyalty and commitment as a pharmacologist since joining in 2012. Having earned his Ph.D., M.Phil., and B.Pharm. from the University of Karachi, Dr. Ahmed possesses a deep-rooted understanding and dedication to his alma mater. His pedagogical and research interests span a comprehensive range of subjects including Physiology, Pathology, Biochemistry, and Pharmacology, reflecting his broad expertise within the pharmaceutical and Pharmacological sciences.

Dr. Ahmed's specific research endeavors are concentrated in the intricate field of Neuropharmacology, where he actively contributes to understanding the effects of drugs on the nervous system. Known for his unwavering dedication to teaching, he consistently goes above and beyond to impart knowledge and inspire his students. His long tenure and continuous involvement highlight a career marked by academic excellence and a profound commitment to both education and cutting-edge research in pharmacology.

Dr. Sadia Ghousia Baig

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
Email: **sgbaig@uok.edu.pk**
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Dr. Sadia holds a Bachelor of Pharmacy (B.Pharm.), Master of Philosophy (M.Phil.) in Pharmacology, and a Ph.D. in Pharmacology from the University of Karachi, with over 24 years of teaching experience in Pharmacy, Medical, and Dental Colleges. Her interests lie in clinical studies and the basic pharmacology of medicinal plants. Dr. Sadia is an HEC-approved supervisor for M.Phil. and Ph.D. students and has authored more than 45 research articles. In addition to teaching Biochemistry and various Pharmacology courses to Pharm.D and research students, she has served as a reviewer for scientific journals such as PJPS and RADS JPPS. She has also worked as a member of several committees, including the Board of Studies, Departmental Research, Quality Enhancement, Time-table, Catalogue Review, at the University of Karachi and Procurement Committee Dow University of Health Sciences.

Dr. Nuzhat Sultana

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2012**
Email: **nuzhat.sultana@uok.edu.pk | nuztsultana@gmail.com**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Dr. Nuzhat Sultana B.Pharm., M.Phil. and Ph.D. (Pharmacology) is an Assistant Professor in the Department of Pharmacology, Faculty of Pharmacy & Pharmaceutical Sciences, University of Karachi. Throughout Dr. Nuzhat's career, she has atmosphere where active inquiry, critical thinking, and the synthesis of theoretical learning with practical application has been promoted. She teaches evidence-based instruction and the development of professional competencies, which has been recognized as an improvement to students' learning experiences. Dr. Nuzhat focused on examining the interplay between neuroscience and toxicology, examining how different agents affect neural function, behavior, and general physiological health. Her research expertise is grounded in a strong understanding of pharmacological mechanisms and examining neurotoxic effects and identifying potential therapeutic interventions. The purpose of this work is to extend understanding of neuronal pathways and to develop strategies to prevent or minimize toxin induced damage.

Dr. Sana Sarfaraz

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., Pharm.D. (University of Karachi)**
Year of Association: **2019**
Email: **ssarfaraz@uok.edu.pk | sana.sarfraz@live.com**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Dr. Sana Sarfaraz is an accomplished academician and researcher affiliated with the Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. She holds a Ph.D. in Pharmacology from the University of Karachi, where she also completed her master's in pharmacology and Doctor of Pharmacy (Pharm-D) with top honors. Her research interests include Neuropharmacology, Endocrinology, and Clinical Pharmacy.

Dr. Sarfaraz has published numerous research articles in various scientific journals and has been recognized with multiple awards and medals for her academic excellence. She also serves as an editorial board member and reviewer for several prestigious journals. She is associated with supervising multiple student clubs, including the Karachi University Pharmacy Science Club and the Community Pharmacy Services. Under her leadership, students have completed various projects concerning women's health and have generated awareness among the female population. She also has experience working as a Pharmacist in the Agha Khan University Hospital and has been affiliated as a training coordinator in various clinical clerkship programs of undergraduate Pharm. D students.

Dr. Adnan Iqbal

Designation: **Lecturer (BPS-18)**
Qualification: **Ph.D., M.Phil., Pharm-D (University of Karachi)**
Year of Association: **2019**
Email: **adnaniqbal@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2206**

Dr. Adnan has worked as a Lecturer (BPS-18) in the Department of Pharmacology, University of Karachi since 2019. He believes in teaching that engages students, promotes critical thinking, and is applicable. He has been recognized for creating a learning environment that supports academic growth. During his service at the University of Karachi, research contributions in metabolic disorders and neuropharmacology have been recognized by invitations to present in prestigious conferences including the International Conference on Pharmacology and Therapeutics. These recognitions validate his continued work to further both educational and scientific communities.

Dr. Adnan has conducted research on the potential of sorafenib in preventing metabolic syndrome in rats fed a high-fat, high-sucrose diet. This work aims to advance understanding and treatment of metabolic disorders.

Board of Studies

Dr. Afshan Siddiq
Professor and Chairperson
Department of Pharmacology
University of Karachi, Karachi

Dr. Syeda Afroz
Professor
Department of Pharmacology
University of Karachi, Karachi

Dr. Sana Sarfaraz
Assistant Professor
Department of Pharmacology
University of Karachi, Karachi

Dr. Adnan Iqbal
Lecturer
Department of Pharmacology
University of Karachi, Karachi

Dr. Fareeda Islam
Professor and Head
Department of Pharmacology
Karachi Medical & Dental College, Karachi

Dr. Mahy Rukh
Professor
Department of Pharmacology,
Dow University of Health Sciences (Ojha Campus), Karachi

Dr. Subia Jamil
Associate Professor
Department of Pharmacology,
Jinnah University for Women, Karachi

Dr. Syed Saad Hussain
Senior Manager
Medical Affairs and Business Development,
Tabros Pharma (Pvt.) Ltd. Head Office, 32-1/C Block 6, PECHS, Block-6, Karachi

Pharm. D. Courses

First Professional					
1st Semester			2nd Semester		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHL-305	Islamic Learning / Pakistan Studies	2	PHL-308	Pharmacology Physiology and Histology-II	3
PHL-307	Pharmacology Physiology and Histology- I	3	PHL-310	Pharmacology-Pharmaceutical Biochemistry II	3
PHL-309	Pharmacology- Pharmaceutical Biochemistry-I	3	PHL-314	Pharmacology-Anatomy	2
PHL-311	Pharmacology- Pharmaceutical Biochemistry (Practical)	3	-	-	-
Second Professional					
PHL - 407	Pharmacology- Physiology and Histology (Practical)	3	PHL-410	Pharmacology- Systemic Pharmacology– I	3
PHL - 409	Pharmacology and Therapeutics	3	-	-	-
PHL - 413	Pharmacology- Pathology	2	-	-	-
Third Professional					
PHL - 507	Pharmacology- Systemic Pharmacology–II	3	PHL - 510	Pharmacology- Pharmacology Lab. - I	3
PHL - 509	Pharmacology- Pathology (Practical)	2	-	-	-
Fourth Professional					
PHL - 609	Pharmacology- Systemic Pharmacology- III	3	PHL - 612	Pharmacology Lab. - II	3
Fifth Professional					
PHL - 711	Pharmacology- Clinical Pharmacology	2	PHL - 712	Pharmacology- Toxicology	2

Total **18** Courses, making **48** Credit Hours in five years.

Pharm. D. Courses – Outline
First Semester

Islamic Learning / Pakistan Studies

PHL-305
Cr. Hrs. 2

1. **The Need for Religion**
   A critical analysis of the sources of human knowledge and importance of *Wahi* (Divine revelation).

2. **Islamic Concept of Life**
   Islamic concept of universe, the position of mankind, the earth, the goal for men's activities.

3. **Islamic Beliefs**
   Islam and aqida, the role of iman in character building and in the development civilization.
   Aqida-tawhid (belief in unity of God) its details and its impact on character. Iman bil Malaikah (belief in angels).
   Aqida risalat (belief in prophethood) its details. Its importance.
   In the development of Islamic civilization, the distinguishing features of Muhammad (PBUH) Prophethood, the doctrine of the last prophet. Iman bil kutub (Belief in the revealed books).
   Aqida Akhrat (Belief in the life hereafter) its details, quranic style of arguments on the life hereafter. The impact of Aqida Akhrat on individual and society. A comparison and Islamic concept of Ibadat with other religions.
   Salat (Prayer). Zakat, its philosophy, rates and minimum zakat amount, its impact on economy. Sawm (Fasting).
   Haj (Pilgrimage): Manasik and its importance.

4. **Pakistan Studies**
   Ideology of Pakistan and its basic elements, two nation theory; Aims and objective for Establishment of Pakistan; The Khilafat Movement. The struggle for Islamic System (with the special reference to constitution of Pakistan 1973); The common problems of Muslim Ummah and their solutions.

5. **Islamic Moral Values**
   Philosophy of morality in Islamic moral values.

Books Recommended

1. Kursheed Ahmed, Islam ka Nazariya hayat.
2. Shiblee Nuamani/Syed Suleman Nadvi. Seerat-un-Nabi (SAWW) Jild-e-Kamil.

Physiology and Histology-I

PHL-307
Cr. Hrs. 3

1. **Physiology of Nerve and Muscle**
   Chemical changes during muscle contraction, nerve action potential, skeletal, smooth muscle and cardiac excitation contraction.

2. **Blood**
   Composition, functions and genesis of formed elements. RBC, WBC and platelet. Fate of RBC, jaundice, reaction of blood, blood groups. Rh factors, ESR, blood volume, function of spleen, blood coagulation, hemophilia, classification of anemias.

3. **Circulatory System**
   Properties of cardiac muscles, origin and conduction of heart beat, cardiac cycle, ECG, heart sounds, cardiac output, stroke volume and heart rate. Nerve supply to heart, coronary, pulmonary and skin circulation. Blood pressure, vasomotor center. Arterial pulse, venous pulse, hemorrhage, circulatory changes in exercise, composition and circulation of lymph, shock.

4. **Skin**
   Structure and functions of skin, temperature regulation.

5. **Digestive System**
   Mastication, deglutition, digestive juices (gastric, pancreatic, bile and intestinal juices) their composition, function and mechanism of secretions. Movement of stomach and intestine, function of large intestine, defecation, functions of liver and gall bladder.

Books Recommended

1. Guyton, A. C., & Hall, J. E. (2015). Textbook of medical physiology (13th ed.). W.B. Saunders.
2. Young, B., O'Dowd, G., & Woodford, P. (2013). Wheater's functional histology: A text and colour atlas (6th ed.). Churchill Livingstone.
3. Paulsen, D. F. (2010). Basic histology: Examination and board review (5th ed.). Prentice Hall International, Inc.
4. Martini, F. H. (2014). Fundamentals of anatomy and physiology (10th ed.). Prentice Hall.
5. Tortora, G. J., & Derrickson, B. (2013). Principles of anatomy and physiology (14th ed.). John Wiley & Sons.

Pharmaceutical Biochemistry-I

PHL-309
Cr. Hrs. 3

1. **Introduction and Basic Biochemical Principles**
   Role of pharmaceutical biochemistry in the health profession, nature of biochemical reactions.

2. **Basic Chemistry of Biomolecules**
   Carbohydrates; Chemistry, classification, reactions, optical activity, biological and pharmaceutical importance of carbohydrates.
   Lipids; Chemistry of fatty acids and lipids classifications, (saponifiable and non-saponifiable lipids, simple, complex and derived). Reactions of fatty acids and other lipids. Essential fatty acids, biological and pharmaceutical importance of lipids.
   Proteins and Amino acids; Chemistry, classification, reactions of proteins and amino acids. Organizational level, macromolecular nature, biological and pharmaceutical importance of proteins and amino acids.

3. **Metabolic Fate of Biomolecules**
   Carbohydrates; Brief digestion and absorption, aerobic and anaerobic breakdown of glucose, glycolysis, pentose phosphate pathway, glycogenolysis, gluconeogenesis, citric acid cycle, energetics of various metabolic processes.
   Lipids; Brief digestion and absorption, oxidation of fatty acids through beta oxidation, Biosynthesis of fatty acids, neutral lipids, and cholesterol.
   Proteins and Amino-acids; Brief digestion and absorption, metabolism of essential and non-essential amino acids, Biosynthesis and catabolism of Haemins and porphyrin compounds.

4. **Bioenergetics**
   Principles of bioenergetics, electron transport chain and oxidative phosphorylation.

5. **Enzymes**
   Chemistry, classification, mode of action, kinetics (Michaelis Menten Equation and some modifications), Inhibition, activation, specificity, allosteric enzymes. Factors affecting the rate of an enzyme catalyzed reaction, Biological and pharmaceutical importance, mechanism of action of some important enzyme (Chymotrypsin, Ribonuclease).

Books Recommended

1. Peet, A., Lieberman, M. A., & Marks, A. (2012). *Marks' basic medical biochemistry* (4th ed.). Lippincott Williams & Wilkins.
2. Nelson, D. L., & Cox, M. M. (2012). *Lehninger principles of biochemistry* (6th ed.). W. H. Freeman.
3. Chatterjee, M. N., & Shinde, R. (2011). *Textbook of medical biochemistry* (8th ed.). Jaypee Brothers Medical Publishers.
4. Champe, P. C., & Harvey, R. A. (2013). *Lippincott's illustrated reviews: Biochemistry* (6th ed.). Lippincott Williams & Wilkins.
5. Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2015). *Harper's illustrated biochemistry* (30th ed.). Lange Medical Books / McGraw-Hill Education.

Pharmaceutical Biochemistry (Practical)

PHL-311
Cr. Hrs. 3

1. **Qualitative Analysis**
   Carbohydrates, amino acids, peptides and proteins. Lipids and sterols (Cholesterol) bile salts and bilirubin. Blood sugar analysis, uric acid, bilirubin, cholesterol and creatinine.

2. **Quantitative Analysis**
   Carbohydrates–Glucose (reducing sugar) and any other carbohydrate using Benedict and Anthrone method. Amino acids, peptides and proteins using Biuret and Ninhydrin (Spectrophotometric) method. Analysis of normal and abnormal constituents of urine sugar. Uric acid, bilirubin, cholesterol and creatinine.

Books Recommended

1. Peet, A., Lieberman, M. A., & Marks, A. D. (2012). *Marks' basic medical biochemistry* (4th ed.). Lippincott Williams & Wilkins.
2. Nelson, D. L., & Cox, M. M. (2012). *Lehninger's principles of biochemistry* (6th ed.). W. H. Freeman.
3. Chatterjee, M. N., & Shinde, R. (2011). *Textbook of medical biochemistry* (8th ed.). Jaypee Brothers Medical Publishers.
4. Champe, P. C., & Harvey, R. A. (2013). *Lippincott's illustrated review: Biochemistry* (6th ed.). Lippincott Williams & Wilkins.
5. Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2015). *Harper's illustrated biochemistry* (30th ed.). McGraw-Hill Education / Lange Medical Books.

Physiology and Histology (Practical)

PHL-407
Cr. Hrs. 3

1. **Introduction to Experimental Physiology**

2. **Blood**
   Determination of hemoglobin. Determination of ESR, RBC count, WBC count, differential leucocytes count, bleeding and clotting time, blood groups..

3. **Respiration**
   Estimation of vital capacity and its relation to posture and standard vital capacity. Determination of tidal volume. Demonstration of artificial respiration.

4. **C.V.S.**
   Recording of arterial pulse, recording of arterial B.P.

5. **Eye**
   Visual acuity, far vision, near vision and field of vision.

6. **C.N.S.**
   Nerve muscle preparation in frog, effect of temperature on muscle, Demonstration of special reflexes.

7. **Histology**
   Demonstration, preparation and staining of the slides, histological examination of slides, epithelium, connective tissue, muscle tissue, organ system - lungs, kidney, appendix, skin, gall bladder, stomach, intestine.

Books Recommended

1. Guyton, A. C., & Hall, J. E. (2015). *Textbook of medical physiology* (13th ed.). W. B. Saunders.
2. Young, B., O'Dowd, G., & Woodford, P. (2013). *Wheater's functional histology: A text and colour atlas* (6th ed.). Churchill Livingstone.
3. Paulsen, D. F. (2010). *Basic histology: Examination and board review* (5th ed.). Prentice Hall International, Inc.
4. Martini, F. H. (2014). *Fundamentals of anatomy and physiology* (10th ed.). Prentice Hall.
5. Tortora, G. J., & Derrickson, B. (2013). *Principles of anatomy and physiology* (14th ed.). John Wiley & Sons.

Pharmacology and Therapeutics

PHL-409
Cr. Hrs. 3

1. **Introduction**
   History and scope of Pharmacology, classification of Pharmacology, classification of drugs and their sources.

2. **Definitions**
   Bioavailability, bioequivalence, therapeutic index, potency, efficacy, risk benefit ratio, selective toxicity, plasma half-life, dose response curve, desensitization and tachyphylaxis.

3. **Drugs Delivery System**
   Advantages and disadvantages of oral medication. Advantages and disadvantages non-oral medication.

4. **Pharmacokinetics**
   Drug solubility and passage of drugs across body membranes, plasma concentration of drugs and various factors affecting it. Factors affecting absorption, distribution, biotransformation and excretion.

5. **Pharmacodynamics**
   Drug receptors and theories, agonist and antagonists, mechanism of drug action, specificity of drug action, and factors modifying the action.

6. **Drugs Acting on Blood**
   Antianemic (Vit B_{12}, folic acid, iron). Coagulants and anticoagulants.

7. **Autonomic Nervous System**
   Introduction to autonomic pharmacology.

8. **Drugs Acting on ANS**
   Sympathetic agonists, sympathetic antagonists, parasympathetic agonists and antagonists, anticholinesterases, ganglion blockers and neuromuscular blockers.

Books Recommended

1. Trevor, A., Katzung, B., Masters, S., & Knuidering-Hall, M. (2015). *Katzung & Trevor's pharmacology examination and board review* (11th ed.). Lange Medical Books.
2. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). Lange Medical Books.
3. Golan, D. E., Tashjian, A. H. Jr., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.). Lippincott Williams & Wilkins.
4. Brunton, L. L., Chabner, B. A., & Knollmann, B. C. (Eds.). (2010). *Goodman & Gilman's the pharmacological basis of therapeutics* (12th ed.). McGraw-Hill.
5. Rang, H. P., & Dale, M. M. (2015). *Rang & Dale's pharmacology* (8th ed.). Churchill Livingstone.

Pharmacology Pathology

PHL-413
Cr. Hrs. 2

1. **Scope of Pathology and Concept of Disease**

2. **Definitions and Terminologies**

3. **Response of Body to Injury and Infection**
   Acute inflammation, chronic inflammation. Immunity, allergy and hyper sensitivity.

4. **Specific Diseases**
   Peptic and duodenal ulcer, hypertension. M.I., SLE, Nephrotic syndrome, COPD.

5. **Diagnosis of Cancer**

   Fate, survival and prognosis of tumors. Leukemia, malignant carcinoma, sarcoma lymphoma.

Books Recommended

1. Cotran, R. S., Kumar, V., & Robbins, S. L. (2014). *Robbins & Cotran pathologic basis of disease* (9th ed.). W. B. Saunders.
2. Golan, D. E., Tashjian, A. H. Jr., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.). Lippincott Williams & Wilkins.
3. Greene, R. J., & Harris, N. D. (2008). *Pathology and therapeutics for pharmacists: A basis for clinical pharmacy practice* (3rd ed.). Chapman & Hall.
4. Lewis, M. G., & Barton, T. K. (2002). *Appleton & Lange's review of general pathology* (4th ed.). Prentice Hall International.
5. Randall, M. D., & Neil, K. E. (2008). *Disease management* (2nd ed.). Pharmaceutical Press.

Systemic Pharmacology-II

PHL-507
Cr. Hrs. 3

1. Drugs Acting on Cardio Vascular System

Angina and antianginal drugs. Thrombosis and thrombolytic agents, Congestive heart failure and its treatment. Cardioactive glycosides, Bipyridines, β-adrenergic blockers. Xanthine derivatives, vasodilators. Antiarrhythmic drugs, Hyperlipidemia and hypocholesterolemic agents. Hypertension, antihypertensives and diuretics.

2. Dermatological Agents

Factors affecting topical absorption of drugs, Pharmacology of dermatological agents.

3. Drugs Acting on Respiratory System

Drug used for treatment of cancer including alkylating agents, mitotic spindle poisons, podophyllotoxins, antibiotic, miscellaneous, topoisomerase, inhibitors and monoclonal antibodies.

4. Anti Neoplastics

Drug solubility and passage of drugs across body membranes, plasma concentration of drugs and various factors affecting it. Factors affecting absorption, distribution, biotransformation and excretion.

Books Recommended

1. Golan, D. E., Tashjian, A. H., Jr., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.). Lippincott Williams & Wilkins.
2. Goodman, L. S., & Gilman, A. (2010). *The pharmacological basis of therapeutics* (12th ed.). McGraw-Hill.
3. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). Lange Medical Books.
4. Rang, H. P., Dale, M. M., Ritter, J. M., & Flower, R. J. (2015). *Rang & Dale's pharmacology* (8th ed.). Churchill Livingstone.
5. Trevor, A., Katzung, B. G., Masters, S., & Knuidering-Hall, M. (2015). *Katzung & Trevor's pharmacology examination and board review* (11th ed.). Lange Medical Books.

Pharmacology Pathology (Practical)

PHL-509
Cr. Hrs. 2

1. Study of Pathological Slides of Various Pathological Conditions

Acute inflammation; chronic inflammation; chronic specific inflammation. Different types of degeneration. Thrombosis, embolism, infarction, necrosis, gangrene, hyperplasia, metaplasia, pigmentation, calcification, C.B.C., papilloma, adenoma, chondroma, fibroma, neofibroma, squamous cell carcinoma, Basal cell carcinoma, transitional cell carcinoma.

Adenocarcinoma, fibrocarcinoma, rhabdomyosarcoma, leiomyosarcoma, lymphosarcoma, liposarcoma, reticular cell sarcoma, Hodgkin's disease, breast carcinoma, osteogenic, sarcoma, osteoclastoma.

2. **Examination of Different Body Fluids in Various Pathological Conditions**
   Urine complete examination, stool examination, blood complete examination. Semen examination, cerebrospinal fluid examination, pericardial fluid examination, pleural fluid examination, aseptic fluid examination, blood sugar, blood urea, blood cholesterol etc.

3. **Tests for Various Specimens of Clinical Importance**
   Techniques of clinical blood examination for various diseases, gastric analysis, Tests for liver function and renal function. Test for endocrine abnormalities, biopsies and cytological techniques.

Books Recommended

1. Cotran, R. S., Kumar, V., & Robbins, S. L. (2014). *Robbins & Cotran pathologic basis of disease* (9th ed.). W. B. Saunders Company.
2. Golan, D. E., Tashjian, A. H., Jr., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.). Lippincott Williams & Wilkins.
3. Greene, R. J., & Harris, N. D. (2008). *Pathology and therapeutics for pharmacists: A basis for clinical pharmacy practice* (3rd ed.). Chapman & Hall.
4. Lewis, M. G., & Barton, T. K. (2002). *Appleton & Lange's review of general pathology* (4th ed.). Prentice Hall International Inc.
5. McPhee, S. J., Papadakis, M., & Tierney, L. M. (2015). *Current medical diagnosis and treatment* (54th ed.). Lange Medical Books, McGraw-Hill Medical Publishing Division.

Systemic Pharmacology - III

PHL-609
Cr. Hrs. 3

1. **Drug Acting on Central Nervous System**
   Hypnotic and sedatives, analgesics, narcotic analgesics and opioids antagonists, anxiolytics, antipsychotics, antidepressants, antimanic, cerebral stimulants, spinal cord stimulants, drug treatment of epilepsy, drug treatment of parkinsonism and other movement disorders.
   General and local anesthetics

2. **Insulin, thyroxin and other agents affecting endocrine function**

3. **Ocular Pharmacology**
   Use of autonomic agents in eyes, chemotherapy of diseases in eye.
   Use of immunomodulatory drugs for ophthalmic therapy; Use of anesthetics in ophthalmic procedures.

4. **Oxytocic Drugs**

5. **Drugs Acting on Reproductive System**
   Contraceptives; fertility drugs; testosterone and contraception in males; erectile dysfunction and pharmacotherapy.

Books Recommended

1. Golan, D. E., Tashjian, A. H., Jr., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.). Lippincott Williams & Wilkins.
2. Goodman, L. S., & Gilman, A. (2010). *The pharmacological basis of therapeutics* (12th ed.). McGraw-Hill Medical.
3. Katzung, B. G., Masters, S. B., & Trevor, A. J. (2014). *Basic and clinical pharmacology* (13th ed.). Lange Medical Books/McGraw-Hill.
4. Rang, H. P., & Dale, M. M. (2015). *Rang & Dale's pharmacology* (8th ed.). Churchill Livingstone.
5. Trevor, A. J., Katzung, B. G., Masters, S. B., & Knuidering-Hall, M. (2015). *Katzung & Trevor's pharmacology examination and board review* (11th ed.). Lange Medical Books.

Clinical Pharmacology

PHL-711
Cr. Hrs. 2

1. **Introduction to Clinical Pharmacology**
   Terminology, basic components and scope.

2. **Role of Drug Monitoring in Therapeutics**
   Patient profile, diseases profile, drug profile, monitoring responses, monitoring plasma concentration.

3. **Factors Affecting Drug Response**
   Pharmacogenetics, drug interactions.

4. **Development of New Drugs**
   Process of drug development, preclinical studies, types of clinical trials, choice of patients, exclusion criteria of patients.

5. **Drugs in Pregnancy**
   Prescribing in pregnancy, harmful effects on fetus, pharmacokinetics in pregnancy.

6. **Drugs in Infants and Children**
   Practical aspects of prescribing drugs, pharmacokinetics.

7. **Drugs in Elderly**
   Pharmacokinetics changes, Pharmacodynamic changes.

8. **Drug Toxicity**
   Adverse drug reactions, monitoring adverse drug reactions, risk benefit ratio.

Books Recommended

1. Atkinson, A. J., Jr., Huang, S.-M., Lertora, J. J. L., & Markey, S. P. (2012). *Principles of clinical pharmacology* (3rd ed.). Academic Press.
2. Kimble, M. A. K. (2012). *Koda-Kimble and Young's applied therapeutics: The clinical use of drugs* (10th ed.). Lippincott Williams & Wilkins.
3. McKay, G. A., & Walters, M. R. (2013). *Clinical pharmacology and therapeutics* (9th ed.). Wiley-Blackwell.
4. Rataboli, P. V. (2010). *Clinical pharmacology and rational therapeutics* (2nd ed.). Ane Books Pvt Ltd.
5. Walker, R., & Whittlesea, C. (2011). *Clinical pharmacy and therapeutics* (5th ed.). Churchill Livingstone.

Second Semester

Physiology and Histology-II

PHL-308
Cr. Hrs. 3

1. **Respiratory System**
   Mechanics of respiration, intrathoracic, intrapulmonary pressure. pulmonary ventilation. Lung's volume and capacities. Composition of inspired air, expired air and alveolar air, carriage of oxygen and CO2 by the blood. Regulation of breathing (nervous and chemical control).

2. **Urinary System**
   Urine formation, composition of urine, urea clearance. Formation of concentrated and dilute urine, regulation of osmolarity, and pH (acidic and basic urine), process of micturition (nervous control), renal failures.

3. **Nervous System**
   Spinal reflexes, reflex regulation of movement and posture. Cerebral cortex functions, voluntary movements, descending tracts of spinal cord. Basal ganglia, cerebellum, thalamus, C.S.F. Autonomic nervous system.

4. **Special Senses**
   Elementary knowledge of structure and function of the special senses.

1. **Endocrinology**
   Definition of hormone. Nature of different types of hormones. Mechanism of action of hormones including pituitary hormones with abnormalities, thyroid gland with pathologies para thyroid hormone, pancreatic hormone with diabetes mellitus, adrenal glands with Cushing syndrome, Addison's disease. Male and female sex hormones.

2. **Histology**
   Underlying principles of histological techniques and staining specific tissues. Staining of paraffin and frozen sections.

Books Recommended

1. Guyton, A. C., & Hall, J. E. (2015). *Textbook of medical physiology* (13th ed.). W.B. Saunders.
2. Martini, F. H. (2014). *Fundamentals of anatomy and physiology* (10th ed.). Prentice Hall.
3. Paulsen, D. F. (2010). *Basic histology: Examination and board review* (5th ed.). Prentice Hall International Inc.
4. Tortora, G. J., & Derrickson, B. (2013). *Principles of anatomy and physiology* (14th ed.). John Wiley & Sons.
5. Young, B., Woodford, P., & O'Dowd, G. (2013). *Wheater's functional histology: A text and colour atlas* (6th ed.). Churchill Livingstone.

Pharmaceutical Biochemistry-II

PHL-310
Cr. Hrs. 3

1. **Vitamins**
   Chemistry, classification (fat-soluble and water-soluble vitamins), biological and pharmaceutical importance of vitamins.

2. **Hormones**
   Chemistry, classification (proteinous and non-proteinous hormones, amino acid derivatives, steroids), biological and pharmaceutical importance of hormones.

3. **Regulation of Metabolic Processes**
   Role of vitamins, physiological role of fat-soluble and water-soluble vitamins. Co-enzymes and their role in the regulation of metabolic processes. Niacin, thiamine, riboflavin, pyridoxine, pantothenic acid, biotin, folic acid and vitamin B12.

4. **Receptor Mediated Regulation (Hormones)**
   Mechanism of action of hormones, physiological roles of various hormones, site of synthesis and target sites of hormones, action, regulation, signal transduction mechanism, role of cAMP, calcium ions and phosphoinositides, tyrosine kinase, JAK-kinase in the regulation of metabolic processes.

5 **Gene Expression**
   Regulation of gene expression, chemistry, transcription and translation, introduction to biotechnology and genetic engineering. Basic principles of recombinant DNA technology, pharmaceutical applications. Genetic switch, inducers, fusion, genes, regulatory genes, zinc finger, helix-turn- helix motif, the leucine-zipper motif.

Books Recommended

1. Champe, P. C., & Harvey, R. A. (2013). *Lippincott's illustrated review: Biochemistry* (6th ed.). Lippincott Williams & Wilkins
2. Chatterjee, M. N., & Shinde, R. (2011). *Textbook of medical biochemistry* (8th ed.). Jaypee Publishers.
3. Murray, R. K. (2015). *Harper's illustrated biochemistry* (30th ed.). Lange Medical Books, McGraw Hill.
4. Nelson, D. L., & Cox, M. M. (2012). *Lehninger principles of biochemistry* (6th ed.). W.H. Freeman.
5. Peet, A., Lieberman, M. A., & Marks, A. (2012). *Marks' basic medical biochemistry* (4th ed.). Lippincott Williams & Wilkins.

Anatomy

PHL-314
Cr. Hrs. 2

1. **Introduction**
   Anatomical terminology, definition of cell, tissue, organ, structure of cell membrane, cytoplasm, organelles, nucleus, cell cycle.

2. **Tissues of Body**
   Cartilage, bone structure and types of bones and joints.

3. **Muscle**
   Structure of skeletal, smooth muscles, and cardiac muscles.

4. **Integumentary System**
   Including skin, glands, hair and nail.

5 **Cardio Vascular System**
   Structure of heart, location, blood supply to heart, types of blood vessels.

6. **Elementary System**
   Name and structure of different parts of elementary system and their interrelationship.

7. **Urinary System**
   Name and structure of organs of urinary system and their inter relationship.

8. **Male and Female Reproductive Systems**
   Endocrine system including pituitary, thyroid and adrenal glands with their structures.

9. **Central Nervous System**
   Including neuron, organization of CNS, brain, cerebrum, cerebellum, brain stem, Pons and medulla oblongata, thalamus, hypothalamus, cranial nerves. Internal structure of spinal cord CSF, sensory and motor pathways, spinal reflexes, peripheral spinal nerves.

10. **Autonomic Nervous System**
    Sympathetic and parasympathetic nervous system.

Books Recommended

1. Applegate, E. (2010). *The anatomy and physiology learning system* (4th ed.). Saunders.
2. Drake, R. L., Vogl, A. W., & Mitchell, A. W. M. (2014). *Gray's anatomy for students* (3rd ed.). Churchill Livingstone.
3. Martini, F. H. (2014). *Fundamentals of anatomy and physiology* (10th ed.). Prentice Hall.
4. Patton, K. T., & Thibodeau, G. A. (2013). *Anatomy & physiology* (8th ed.). Mosby.
5. Tortora, G. J., & Derrickson, B. (2013). *Principles of anatomy and physiology* (14th ed.). John Wiley & Sons.

Systemic Pharmacology - I

PHL-410
Cr. Hrs. 3

1. **Autacoids and their Antagonists**
   Serotonin and serotonin antagonist, other autacoids; histamine and antihistamines, prostonoids.

2. **Inflammatory Disorders**
   Medication for inflammatory disorders; uricosuric agents; glucocorticoids.

3. **Drugs Acting on G.I.T. System**
   Gastroesophageal reflux disease and its treatment; emesis and antiemetics; constipation and laxatives. Diarrhea and antidiarrheals; peptic and duodenal ulcer, drugs used in their treatments; drugs for inflammatory bowel disease, and for cholelithiasis; prokinetics.

4. **Chemotherapy**
   Introduction, principles of cell proliferation and chemotherapy. Principles of combination therapy, resistance of chemotherapy.

5. **Chemotherapeutic Drugs**
   Antimicrobial, antiviral, antiprotozoal, antifungal, anthelminthic, antimycobacterial.

Books Recommended

1. Golan, D. E., Tashjian, A. H., Jr., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.). Lippincott Williams & Wilkins.
2. Goodman & Gilman. (2010). *The pharmacological basis of therapeutics* (12th ed.). McGraw-Hill.
3. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). Lange Medical Books.
4. Rang, H. P., & Dale, M. M. (2015). *Rang & Dale's pharmacology* (8th ed.). Churchill Livingstone.
5. Trevor, A., Katzung, B., Masters, S., & Knuidering-Hall, M. (2015). *Katzung & Trevor's pharmacology examination and board review* (14th ed.). Lange Medical Books.

Pharmacology - Pharmacology (Practical)

PHL-510
Cr. Hrs. 3

1. Research methods and experimental techniques in pharmacology.
2. Development of experimental design and animal handling.
3. Routes of administration.
4. Preparation of physiological salt solutions.
5. To demonstrate the effects of sympathomimetic and sympatholytic drugs on frog's heart.
6. To demonstrate the effects of parasympathomimetic and parasympatholytic drugs on frog's heart.
7. To demonstrate the effects of an unknown drug on frog's heart.
8. To demonstrate the effects of vasoconstrictor drugs on frog's blood vessels.
9. To demonstrate the effects of stimulant drugs on rabbit's intestine.
10. To demonstrate the effects of depressant drugs on rabbit's intestine.
11. To demonstrate the effects of an unknown drug on rabbit's intestine and identify the (unknown) drug.
12. To study the effects of adrenaline on rabbit's eyes.
13. To study the effects of homatropine on rabbit's eyes.
14. To study the effects of pilocarpine on rabbit's eyes.
15. To study the effects of local anesthetic drug.
16. To determine the analgesic response of the given drug.

Books Recommended

1. Harvey, R. A., Clark, M. A., Finkel, R., Rey, J. A., & Whalen, K. (2014). *Pharmacology* (6th ed.). Lippincott's Illustrated Reviews, Lippincott Williams & Wilkins.
2. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). A Lange Medical Book.
3. Pillai, K. K. (2012). *Experimental pharmacology.* CBS Publishers.
4. Suckow, M. A., Stevens, K. A., & Wilson, R. P. (2012). *The laboratory rabbit, guinea pig, hamster, and other rodents* (1st ed.). Academic Press.
5. Thapa, B. M., & Purohit, A. (2010). *Practical manual of experimental and clinical pharmacology* (1st ed.). Jaypee Brothers Medical Publishers.

Pharmacology Lab-II

PHL-612
Cr. Hrs. 3

1. To study the convulsant effect of strychnine and picrotoxin in frogs and to determine the site of action.
2. To observe the effect of drugs on gross behavioral changes of animal.
3. To observe the effect of drugs on exploratory behavior of mice.
4. To identify the unknown (convulsant) drug and determine its site of action.
5. To observe the anti-inflammatory effect of given drug by hind paw method.
6. To observe the effect of a diuretic in animal.
7. To observe the hypoglycemic effect of drugs in rabbit.
8. To identify and differentiate the effects of unknown drug on human and the nerve plexus of frog.
9. To demonstrate the effects of acetylcholine on the rectus abdominus muscle of frog and competitive pharmacological antagonism by Neuromuscular blocking agents.
10. To identify the unknown drug by performing pharmacological competitive antagonism on rectus abdominus muscle of frog.
11. To study the effects of heparin and oral anticoagulants on rabbits.
12. To identify the unknown anticoagulant drug using rabbits.

13. To identify unknown concentration of acetylcholine from graded dose-response curves.
14. To observe the effect of drug on swimming induced depression.
15. To observe the effects of drug on learning behavior of animal.

Books Recommended

1. Harvey, R. A., Clark, M. A., Finkel, R., Rey, J. A., & Whalen, K. (2014). *Pharmacology* (6th ed.). Lippincott Williams & Wilkins.
2. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). A Lange Medical Book.
3. Pillai, K. K. (2012). *Experimental pharmacology.* CBS Publishers.
4. Suckow, M. A., Stevens, K. A., & Wilson, R. P. (2012). *The laboratory rabbit, guinea pig, hamster, and other rodents* (1st ed.). Academic Press.
5. Thapa, B. M., & Purohit, A. (2010). *Practical manual of experimental and clinical pharmacology* (1st ed.). Jaypee Brothers Medical Publishers.

Toxicology

PHL-712
Cr. Hrs. 2

1. **Principles of Toxicology**
   Principles of treatment of poisoning, classification of toxic agents, spectrum of undesired effects, mechanisms of toxicity.

2. **Disposition of Toxicants**
   Absorption, distribution and elimination of toxicants, biotransformation of xenobiotics.

3. **Target Organs of Toxicity**
   Toxic responses of the blood, toxic responses of the liver, toxic responses of the heart, toxic responses of the kidney, toxic responses of reproductive system.

4. **Environmental Toxicology**
   Air pollution and ecotoxicology.

5. **Applications of Toxicology**
   Food toxicology, forensic toxicology, clinical toxicology, occupational toxicology, risk assessment.

Books Recommended

1. Hodgson, E., & Levi, P. E. (2010). *A textbook of modern toxicology* (4th ed.). John Wiley & Sons.
2. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). A Lange Medical Book.
3. Klaassen, C. D. (2013). *Casarett & Doull's toxicology: The basic science of poisons* (8th ed.). McGraw Hill Medical Publishing Division.
4. Lu, F. C., & Kacew, S. (2012). *Lu's basic toxicology: Fundamentals, target organs and risk assessment* (6th ed.). CRC Press.
5. Timbrell, J. A. (2001). *Introduction to toxicology* (3rd ed.). Taylor & Francis.

Pharm. D. (Deficiency) Courses

1st Semester			2nd Semester		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHL-711(D)	Clinical Pharmacology	3	PHL-712(D)	Toxicology	3
PHL-715(D)	Anatomy	2	PHL-718(D)	Physiology and Histology (Practical) Pharmaceutical Biochemistry (Practical)	3
PHL-721(D)	Pathology (Theory and Practical	2+1			
Total **5** courses, making **14** Credit hours in one year.					

Pharm. D. Deficiency Courses - Outline

First Semester

Clinical Pharmacology

PHL-711(D)
Cr. Hrs. 2

1. **Introduction to Clinical Pharmacology**
   Terminology, basic components and scope.
2. **Role of Drug Monitoring in Therapeutics**
   Patient profile, diseases profile, drug profile, monitoring responses, monitoring plasma concentration.
3. **Factors Affecting Drug Response**
   Pharmacogentics, drug interactions.
4. **Development of New Drugs**
   Process of drug development, preclinical studies, types of clinical trials, choice of patients, exclusion criteria of patients.
5. **Drugs in Pregnancy**
   Prescribing in pregnancy, harmful effects on fetus. Pharmacokinetics in pregnancy.
6. **Drugs in Infants and Children**
   Practical aspects of prescribing. Pharmacokinetics.

7. **Drugs in Elderly**
   Pharmacokinetics changes. Pharmacodynamic changes

8. **Drug Toxicity**
   Adverse drug reactions. Monitoring adverse drug reactions, benefit risk ratio.

9. **Pharmacology of Nutrients**

Books Recommended

1. Atkinson, A. J. Jr., Huang, S.-M., Lertora, J. J. L., & Markey, S. P. (2012). *Principles of clinical pharmacology* (3rd ed.). Academic Press.
2. Kimble, M. A. K. (2012). *Koda-Kimble & Young's applied therapeutics: The clinical use of drugs* (10th ed.). Lippincott Williams & Wilkins.
3. McKay, G. A., & Walters, M. R. (2013). *Clinical pharmacology and therapeutics* (9th ed.). Wiley Blackwell.
4. Rataboli, P. V. (2010). *Clinical pharmacology and rational therapeutics* (2nd ed.). Ane Books Pvt. Ltd.
5. Walker, R., & Whittlesea, C. (2011). *Clinical pharmacy and therapeutics* (5th ed.). Churchill Livingstone.

Anatomy

PHL-715(D)
Cr. Hrs. 2

1. **Introduction**
   Anatomical terminology, definition of cell, tissue, organ, structure of cell membrane, cytoplasm organelles, nucleus, cell cycle.

2. **Tissues of Body**
   Cartilage, bone structure and types of bones and joints.

3. **Muscle**
   Structure of skeletal, smooth muscles, and cardiac muscles.

4. **Integumentary System**
   Including skin, glands, hair and nail.

5. **Cardio Vascular System**
   Structure of heart, location, blood supply to heart, types of blood vessels.

6. **Elementary System**
   Name and structure of different parts of elementary system and their inter relationship.

7. **Urinary System**
   Name and structure of organs of urinary system and their inter relationship.

8. **Male and Female Reproductive Systems**
   Endocrine system including pituitary, thyroid and adrenal glands with their structures.

9. **Nervous System**
   Including neuron, organization of CNS, brain, cerebrum, cerebellum, brain stem, pons and medulla oblongata, thalamus, hypothalamus, cranial nerves. Internal structure of spinal cord CSF, sensory and motor pathways, spinal reflexes, peripheral spinal nerves.

10. **Autonomic Nervous System**
    Sympathetic and parasympathetic nervous system.

Books Recommended

1. Applegate, E. (2010). *The anatomy and physiology learning system* (4th ed.). Saunders.
2. Drake, R. L., Vogl, A. W., & Mitchell, A. W. M. (2014). *Gray's anatomy for students* (3rd ed.). Churchill Livingstone.
3. Martini, F. H. (2014). *Fundamentals of anatomy and physiology* (10th ed.). Prentice Hall.
4. Patton, K. T., & Thibodeau, G. A. (2013). *Anatomy & physiology* (8th ed.). Mosby.
5. Tortora, G. J., & Derrickson, B. (2013). *Principles of anatomy and physiology* (14th ed.). John Wiley & Sons.

Pathology (Theory + Practical)

PHL-721(D)
Cr. Hrs. 2+1

1. **Scope of Pathology and Concept of Diseases**

2. **Definition and Terminology**

Ischemia	.....	Hypoxia
Necrosis	.....	Infarction
Atrophy	.....	Hypertrophy
Hyperplasia	.....	Metaplasia
Aplasia	.....	Anaplasia

3. **Response of Body to Injury and Infection**
   Acute inflammation, chronic inflammation, immunity, allergy and hypersensitivity.

4. **Specific Diseases**
   Peptic and duodenal ulcer, hypertension, leukaemia or blood cancer, malignant carcinoma, sarcoma and lymphomas.

5. **Diagnosis and Treatment of Cancer**
   Fate, survival and prognosis of tumors.

Pathology (Practical)

1. **Study of Pathological Slides of Various Pathological Conditions**
   Acute inflammation, chronic inflammation, chronic specific inflammation, different types of degeneration, thrombosis, embolism, infarction, necrosis, gangrene, hyperplasia, metaplasia, pigmentation, calcification, C.V.C., papilloma, adenoma, chondroma, fibroma, leiomyoma, neofibroma, Squamous cell carcinoma, basa l cell carcinoma, transitional cell carcinoma, adenocarcinoma, fibrocarcinoma, rhabdomyosarcoma, leiomyosarcoma, lymphosarcoma, liposarcoma, reticular cell sarcoma, Hodgkin's disease, breast carcinoma, osteogenic, sarcoma, osteoclastoma.

2. **Examination of Different Body Fluids in Various Pathological Conditions**
   Urine complete examination, stool examination, blood complete examination, semen examination, cerebrospinal fluid examination, pericardial fluid examination, pleural fluid examination, aseptic fluid examination, blood sugar, blood urea, blood cholesterol etc.

3. **Tests for Various Specimens of Clinical Importance**
   Techniques of clinical blood examination for various diseases, gastric analysis, tests for liver function test, renal function test, test for endocrine abnormalities, biopsies and cytological techniques.

Books Recommended

1. Cotran, R. S., Kumar, V., & Robbins, S. L. (2014). *Robbins & Cotran pathologic basis of disease* (9th ed.). W. B. Saunders Company.
2. Golan, D. E., Tashjian, A. H., Armstrong, E. J., & Armstrong, A. W. (2011). *Principles of pharmacology: The pathophysiologic basis of drug therapy* (3rd ed.).
3. Greene, R. J., & Harris, N. D. (2008). *Pathology and therapeutics for pharmacists: A basis for clinical pharmacy practice* (3rd ed.). Chapman & Hall.
4. Lewis, M. G., & Barton, T. K. (2002). *Appleton & Lange's review of general pathology* (4th ed.). Prentice Hall International Inc.
5. McPhee, S. J., Papadakis, M. A., & Tierney, L. M. (2015). *Current medical diagnosis and treatment* (54th ed.). Lange Medical Books, McGraw-Hill Medical Publishing Division.

Second Semester

Toxicology

PHL-712(D)
Cr. Hrs. 3

1. **Principles of Toxicology**
   Principles of treatment of poisoning, classification of toxic agents, spectrum of undesired effects, mechanisms of toxicity, risk assessment.

2. **Disposition of Toxicants**
   Absorption, distribution and elimination of toxicants, biotransformation of xenobiotics, toxicokinetics

3. **Target Organs of Toxicity**
   Toxic responses of the blood, toxic responses of the liver, toxic responses of the heart, toxic responses of the kidney, toxic responses of reproductive system.

4. **Environmental Toxicology**
   Air pollution, ecotoxicology, toxic effects of plants.

5. **Application of Toxicology**
   Food toxicology, forensic toxicology, clinical toxicology, occupational toxicology.

Books Recommended

1. Hodgson, E., & Levi, P. E. (2010). *A textbook of modern toxicology* (4th ed.). John Wiley & Sons, Inc.
2. Katzung, B. G., Masters, S., & Trevor, A. (2014). *Basic and clinical pharmacology* (13th ed.). A Lange Medical Book.
3. Klaassen, C. D. (2013). *Casarett & Doull's toxicology: The basic science of poisons* (8th ed.). McGraw-Hill Medical Publishing Division.
4. Lu, F. C., & Kacew, S. (2012). *Lu's basic toxicology: Fundamentals, target organs, and risk assessment* (6th ed.). CRC Press.
5. Timbrell, J. A. (2001). *Introduction to toxicology* (3rd ed.). Taylor & Francis Ltd.

Histology (Practical)
Pharmaceutical Biochemistry (Practical)

PHL-718(D)
Cr. Hrs. 2+1

1. **Introduction Experimental Physiology**

2. **Blood**
   Determination of haemoglobin, determination of ESR, RBC count, WBC count, differential leucocyte count, bleeding and clotting time, blood groups.

3. **Respiration**
   Estimation of vital capacity and its relation to posture and standard vital capacity, determination of tidal volume, demonstration of artificial respiration.

4. **C.V.S**
   Recording of arterial pulse, recording of arterial B.P.

5. **Eye**
   Visual acuity, far vision, near vision and field of vision.

6. **C.N.S**
   Nerve muscle preparation in frog, effect of temperature on muscle, demonstration of special reflexes.

7. **Histology**
   Demonstration, preparation and staining of the slides, histological examination of slides, epithelium, connective tissue, muscle tissue, organ –system –lungs, kidney, appendix, skin, gall–bladder, stomach, intestine.

8. **Qualitative Analysis**
   Carbohydrates. amino acids, peptides and proteins. Lipids and sterols (cholesterol) bile salts and bilirubin. Blood analysis-sugar, uric acid, bilirubin, cholesterol and creatinine.

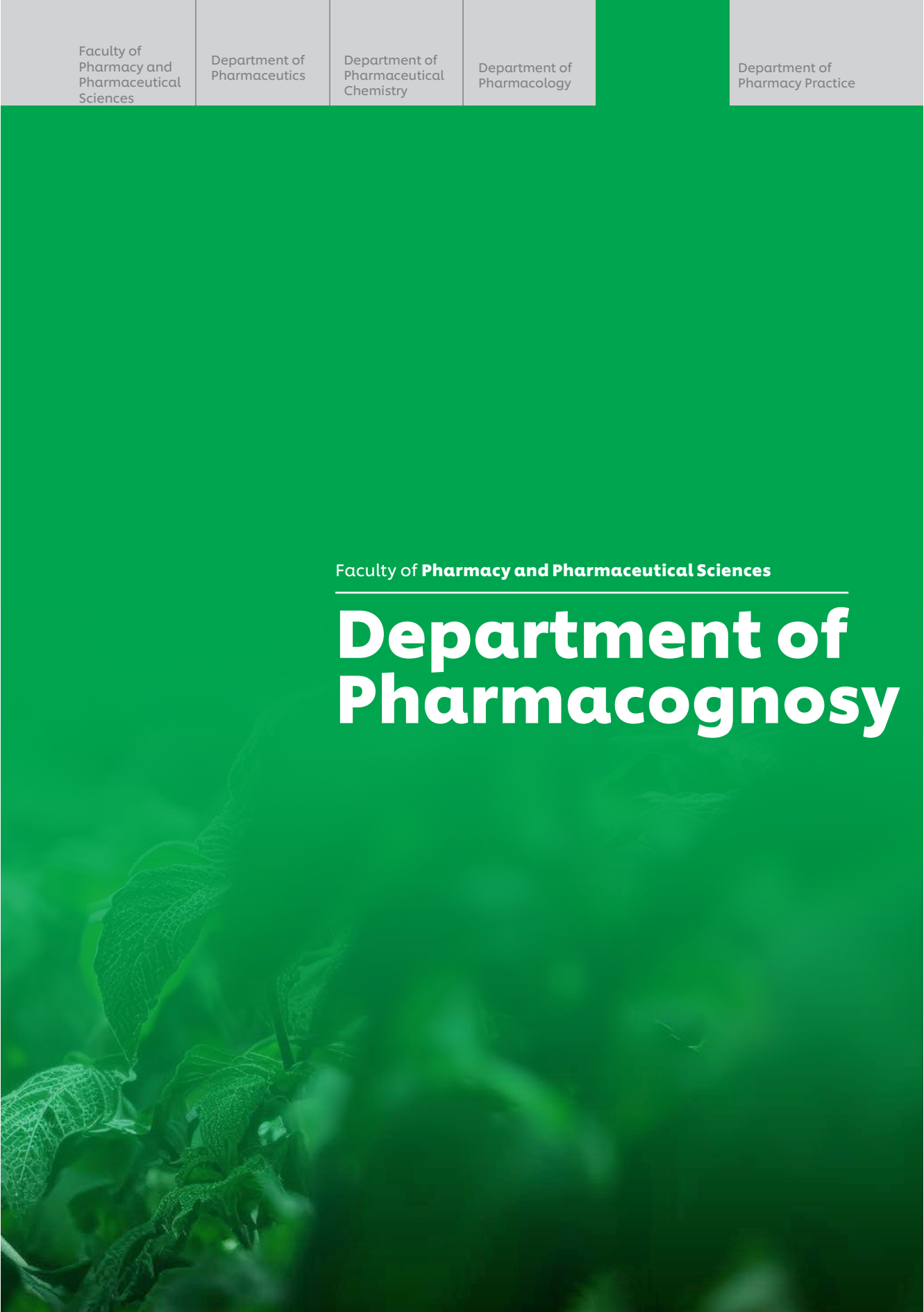
9. **Quantitative Analysis**
   Carbohydrates-glucose (reducing sugar) and any other carbohydrate using Benedict and Anthrone method. Amino acids, peptides and proteins using Biuret and Ninhydrin (Spectrophotometric) method. Analysis of normal and abnormal components of urine –sugar, uric acid, bilirubin, cholesterol and creatinine.

Books Recommended

1. Champe, P. C., & Harvey, R. A. (2013). *Lippincott's illustrated review: Biochemistry* (6th ed.). Lippincott Williams & Wilkins.
2. Guyton, A. C., & Hall, J. E. (2015). *Textbook of medical physiology* (13th ed.). W.B. Saunders.
3. Murray, R. K. (2015). *Harper's illustrated biochemistry* (30th ed.). Lange Medical Books, McGraw-Hill.
4. Paulsen, D. F. (2010). *Basic histology: Examination and board review* (5th ed.). Prentice Hall International, Inc.
5. Tortora, G. J., & Grabowski, S. R. (2013). *Principles of anatomy and physiology* (14th ed.). John Wiley & Sons.

Faculty of **Pharmacy and Pharmaceutical Sciences**

Department of Pharmacognosy



Message from the Chairperson

The discipline of Pharmacognosy is the formal study of natural products from all aspects. It is an important and integral part of modern medical research, and its horizons will keep on expanding as we explore nature for its hidden secrets. Surprisingly, even with our great strides in medicine and our relative drug sophistication, the recent years have witnessed a renewed interest in natural products. In current scenario, this applied branch of pharmaceutical sciences also covers the emerging disciplines such as Phytochemistry, Medicinal Chemistry, Plant toxicology, Histology, Chemotaxonomy, Phytomedicine, Oceanography, Pharmacokinetics and dynamics, and Pharmacoeconomics to provide relief to human sufferings.

I wish you all the success in your bright career ahead.

Prof. Dr. Muhammad Mohtasheem ul Hasan

Department of **Pharmacognosy**

Pharmacognosy derives its origin from two Greek words, pharmakon meaning drug, and gnosis meaning knowledge. It is the study of natural bioactive substances obtained from terrestrial and marine plants, animals, microbes and minerals for their physical, chemical, biochemical and biological properties, their taxonomy and ethnobiology. Pharmacognosy is one of the major areas of pharmaceutical sciences; today is a highly interdisciplinary science, linked to phytochemistry, microbial chemistry, biosynthesis, biotransformation, chemotaxonomy, biotechnology and other biological and chemical sciences. Research in Pharmacognosy provides for the discovery of lead compounds for drug development, new methods of analysis for drugs, toxins and herbal preparations.

The objective of the Department of Pharmacognosy is to educate students about the natural source of drugs, their pharmacognostic and phytopharmacological attributes, chemical and spectroscopic profile of isolated molecules and their development as modern pharmaceutical products.

"Then eat from all the fruits and follow the ways of your Lord laid down [for you]. There emerges from their bellies a drink (honey), varying in colors, in which there is healing for people. Indeed in that is a sign for a people who give thought." (Sūrat l-Nahl (The Bees): verse (68-69)
The Prophet Muhammad (PBUH) said, **"Make use of the two cures: honey and the Qur'an".** [Ibn Majah & others]
Hazrat Abu Hurairah States – **"I have heard from Rasool Allah (PBUH) that there is cure for every disease in black seeds except death and black seeds are Shooneez."**
Hippocrates, the father of modern medicine, 2,500 years ago. said, **"Let food be thy medicine and medicine be thy food".**

Contact Details

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Website: https://www.uok.edu.pk/faculties/pharmacognosy/index.php

Vision and Mission Statement

• Vision

"Advancing the science of Pharmacognosy and its application by integrating traditional knowledge, natural products, and modern techniques to develop safe, effective, and innovative solutions in medicine and healthcare."

• Mission

"To advance the science of Pharmacognosy by integrating traditional knowledge and natural products with cutting-edge research and modern techniques, thereby developing safe, effective, and innovative solutions for medicine and healthcare."

Group Photo of the Department

Sitting, from L to R: Dr. Maryam Ahmed, Dr. Salman Ahmed, Prof. Dr. Muhammad Mohtasheemul Hasan, Prof. Dr. Iqbal Azhar, Dr. Safia Abidi.

Standing: Ms. Farah Mazhar

Dr. Muhammad Mohtasheem ul Hasan

Designation: **Professor and Chairman**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
Email: **mohassan@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2202, +92-333216091**

Muhammad Mohtasheem ul Hasan graduated from Faculty of Pharmacy, University of Karachi and got M.Phil. and Ph.D. degrees in Pharmacognosy from the same institution. He has worked in quality control department in W. Woodward, Searle and B. Braun Pakistan. He has also worked in Hamdard University as Research Associate. He has authored 134 research papers in National and International reputed journals. He has supervised 25 M.Phil. and 3 Ph.D. students.

Dr. Iqbal Azhar

Designation: **Professor**
Qualification: **Ph.D., M.Pharm., B.Pharm. (University of Karachi)**
Year of Association: **1994**
Email: **iazhar@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2202**

Iqbal Azhar received his graduate degree in Pharmacy from Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. He completed M.Pharm. and Ph.D. in Pharmacognosy from the same institution. He is a member of several professional organizations like Pakistan Pharmacist Association, Pakistan Pharmacological Society and Chemical Society of Pakistan. He has also served as Dean, Faculty of Pharmacy and Pharmaceutical Sciences from 2015 to 2018 and Editor-in-Chief of Pakistan Journal of Pharmaceutical Sciences for the same period. He is Associate Editor of Pakistan Journal of Pharmaceutical Sciences from 2018 till date.

He has Supervised 18 Ph.D., 16 M.Phil. and 14 M.Pharm. students. About 144 publications in reputed national and international journals are credited to him.

Dr. Huma Sharif

Designation: **Professor**
Qualification: **Post Doc (UCL, London), Ph. D, M.Phil., Pharm. D (condensed), B.Pharm. PGD(Stat.) (University of Karachi); DHEP(LUMS)**
Year of Association: **2025**
Email: **huma.shareef@uok.edu.pk**
Phone: **(+92-21) 99261300-7 Ext. 2202**

She has enormous professional teaching and research experience including undergraduates and postgraduate students at different private and public sector universities with sound knowledge of instructional and web technologies. Earlier, she worked in multinational and national pharmaceutical industry.
Prof. Shareef's research interest lies in phytomedicine development and phytochemical analysis of medicinal plants, modern extraction procedures, nanotechnology based targeted drug delivery of herbal drugs. She also investigated the pharmacological importance of medicinal plants in different *in vivo* and *in vitro* animal models. Nutraceuticals and cosmeceuticals are also here interests.

Dr. Maryam Ahmed

Designation: **Associate Professor**
Qualification: **Ph.D., B.Pharm. (University of Karachi)**
Year of Association: **2018**
Email: **maryamahmed@uok.edu.pk**
Phone: **(+92-21) 99261300-7, Ext. 2202**

Maryam Ahmed received B.Pharm. and Ph.D. degrees from department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical sciences, University of Karachi. In 2014, awarded gold medal from Pakistan Society of Pharmacognosy.
Her research and teaching focus on the phytochemicals, nutraceuticals, cosmeceuticals and herbal contributions in the clinical management of diseases.

Ms. Farah Mazhar

Designation: **Assistant Professor**
Qualification: **M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2000**
Email: **famazhar@uok.edu.pk**
Phone: **(+92-21) 99261300-7, Ext. 2202**

Ms. Farah Mazhar is an academic and researcher in Pharmacognosy, with over two decades of teaching and research experience at the University of Karachi, Pakistan. She earned her M.Phil. and B.Pharm. degrees, from the University of Karachi, Pakistan.

Her research is focused on phytochemistry, pharmacognostic and biological evaluation of natural products, and phytocosmeceutical. Her expertise spans phytopharmaceuticals, phytochemistry, the biological and chemical analysis of natural products, and standardization of herbal medicines.

Ms. Mazhar has authored number of research papers, book, and book chapters, contributing significantly to Pharmacognosy and Pharmaceutical sciences. She has been recognized with the Gold Medal by the Pakistan Society of Pharmacognosy and as a Productive Scientist of Pakistan by the Pakistan Council for Science and Technology.

An active member of professional societies, she has organized and participated in various national and international workshops, seminars, and conferences. She is also a registered pharmacist and an advocate for advancing research and quality education in Pharmacognosy.

Dr. Salman Ahmed

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2013**
Email: **salmanahmed@uok.edu.pk**
Phone: **(+92-21) 99261300-7, Ext. 2202**

Salman Ahmed holds a B.Pharm., degree from the University of Karachi, Pakistan, and a Ph.D., and M.Phil., in Pharmacognosy from the same institution. He has gained valuable experience in the pharmaceutical industry, having worked at Helix Pharma, Pharm Evo (Pvt.) Ltd., and Searle Pakistan Ltd. He has been an Assistant Professor in the Department of Pharmacognosy at the Faculty of Pharmacy, University of Karachi, Pakistan since 2016. He has authored 114 research papers (91 International and 23 National). Additionally, he has written 7 books and presented 16 posters at national and international conferences. Salman Ahmed's expertise is acknowledged by various esteemed journals published by Elsevier, Springer Nature, Wiley, MDPI, Hindawi, and Dove Medical Press Limited, as he serves as an invited reviewer for these publishers.

Dr. Safia Abidi

Designation: **Assistant Professor**
Qualification: **Ph.D., M.Pharm., B.Pharm. (University of Karachi)**
Year of Association: **2013**
Email: **safiaabidi@uok.edu.pk**
Phone: **(+92-21) 99261300-7, Ext. 2202, +92-3322869187**

Safia Abidi, B.Pharm., M.Pharm., Ph.D., RPh. is an Assistant Professor in the Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi. She received her B.Pharm. from Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in 2006. In 2010 she completed her Masters in Pharmacy. She then received her Ph.D. in Pharmacognosy from Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi in 2018. Her research and teaching is based on natural product and ethanopharmacognosy of natural biomarkers, formulation and development of medicines from natural sources, nutraceutical, and cosmeceuticals.

Board of Studies

Dr. Muhammad Mohtasheemul Hasan
Professor and Chairman

Dr. Huma Sharif
Professor
Department of Pharmacognosy
University of Karachi

Dr. Maryam Ahmed
Associate Professor
Department of Pharmacognosy
University of Karachi

Ms. Farah Mazhar
Assistant Professor
Department of Pharmacognosy
University of Karachi

Prof. Dr. Nudrat Fatima
Principal
College of Pharmacy
Ziauddin University
Link Road, Karachi.

Prof. Dr. Sheikh Abdul Khaliq
Department of Pharmacy
Hamdard University
Karachi

Dr. Zafar Alam Mehmood
Country Manager,
Colorcon Limited England
A Subsidiary of Brewing Pharmaceutical Inc.
Dartford, Kent, UK.

Dr. Faheem Ahmed
Plant Manager
Bosch Pharmaceuticals (Pvt.) Ltd.
Karachi.

Pharm. D. Courses

First Professional					
1st Semester			**2nd Semester**		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
-	-	-	PHG-312	General Pharmacognosy	3
Second Professional					
PHG-411	Herbal Quality Control Lab - I	3	PHG-412	Chemical Pharmacognosy - I	3
-	-	-	-	*English Compulsory	-
Third Professional					
PHG-511	Chemical Pharmacognosy - II	3	PHG-512	Herbal Quality Control Lab - II	3
-	-	-	PHG-514	Natural Toxins	2
Fourth Professional					
PHG-611	Advance Pharmacognosy	3	-	-	-
Fifth Professional					
PHG-713	Clinical Pharmacognosy	2	-	-	-
Total of **8** courses comprising **22** credit hours, distributed over five years.					

*English compulsory course is taught in 1st year (second semester) as a non-credit course, under the Department of Parmacognosy.

Pharm. D. Courses – Outline
First Semester

Herbal Quality Control Lab-I

PHG-411
Cr. Hrs. 3

1. Physical Methods

a. Macroscopic / Organoleptic Evaluation

Plant Drugs
Organized Drugs

Seed:	*Cucumis melo, Datura stramonium, Lallementia royleana, Nigella sativa, Psoralea corylifolia, Ricinus communis, Strychnos nux-vomica.*
Fruit:	*Aegle marmelos, Cassia fistula, Ficus carica, Phycotis ajowan, Terminalia chebula, Tribulus terrestris.*
Pod:	*Cassia fistula, Helicteres isora, Moringa olifera, Papaver somniferum.*
Flower:	*Catheranthus roseus, Hibiscus rosa-sinensis, Moringa olifera, Onosma bracteatum, Punica granatum, Viola odorata.*
Leaf:	*Catharanthus roseus, Cinnamomum zeylanicum, Cordia myxa, Gymnema sylvester, Lawsonia innermis, Ocimum tenuiflorum, Onosma bracteatum*
Bark:	*Acacia nilotica, Azadirachta indica, Cinnamomum zeylanicum, Onosma echioides, Valeriana hardwickii, Saraca indica, Prosopis juliflora.*
Root:	*Glycyrrhiza glabra, Valeriana officinalis.*
Rhizome:	*Alpinia officinarium, Curcuma amada, Curcuma longa, Smilax china, Zingiber officinale.*

Unorganized Drugs

Extracts:	*Aloe indica, Uncaria gambir, Rhus toxicodendron.*
Exudates:	*Acacia arabica, Bambusa arundinacea, Ferula foetida, Styrax benzoin.*

Animal Drugs

Apis melifera, Bombyx mori, Cantheris vesicatoria, Cervus elephus, Laccifer lacca, Ovis aries.

Mineral Drugs

Alum, Borax, Sulphur, Ammonium chloride, Asphalt, Magnesium salts, Aluminium hydroxide, Sodium bicarbonate.

b. Microscopic Evaluation

Section Cutting
Transverse sections of the following crude drugs:

Stem:	*Ephedra sinica, Santalum album, Tinospora cordifolia*
Leaf:	*Cassia senna, Eucalyptus globulus, Mentha piperita*
Fruit:	*Piper nigrum, Foeniculum vulgare*
Seed:	*Myristica fragrans, Ricinus communis, Strychnos nux-vomica*
Bark:	*Catharanthus roseus, Cinnamomum zeylanicum, Cordia myxa, Gymnema sylvester, Lawsonia innermis, Ocimum tenuiflorum, Onosma bracteatum*
Bark:	*Azadirachta indica, Cinnamomum zeylanicum, Saraca indica*
Root:	*Glycyrrhiza glabra, Rauwolfia serpentina*
Rhizome:	*Curcuma longa, Zingiber officinale*
Flower Bud:	*Eugenia caryophyllus*

Powder Microscopy

Powder microscopy of the following crude drugs:

Bark:	*Acacia nilotica, Azadirachta indica, Cinnamomum zeylanicum*
Seed:	*Hyocyamus niger, Strychnos nux-vomica, Trigonella foenum-graecum*
Flower:	*Eugenia caryophyllus, Matricaria Chamomilla, Punica granatum*
Leaf:	*Cassia senna, Lawsonia innermis, Mentha piperita*
Fruit:	*Coriandrum sativum, Foeniculum vulgare, Illicium verum*
Root:	*Glycryrrhiza glabra, Rauwolfia serpentina, Valeriana officinalis*
Rhizome:	*Alpinia officinarium, Curcuma longa, Zingiber officinale*

c. Determination of stomatal index, Palisade ratio and type of stomata

Determine the stomatal index, palisade ratio and type of stomata of the following leaf drugs:
Leaf: *Cassia senna, Eucalyptus globulus, Mentha piperita*

d. Determination of Foreign Matter, Moisture Content, Extractive Value, Ash Value

Determine the foreign matter, moisture content, extractive value and ash value of the following drugs:
Cassia senna leaf, *Glycyrrhiza glabra* root, *Trigonella foenum-graecum* seeds

2. Physical Methods

a. Determination of Swelling Index

Determine the swelling index of the following seed drugs:
Triognella foenum-graecum, Lallemantia royleana, Plantago ovata, Linum usitatissimum

b. Determination of Foaming Index

Determine the foaming index of the following drugs:
Sapindus trifoliatus (fruit), *Triognella foenum-graecum* (seed), *Ziziphus mauritiana* (fruit), *Medicago sativa* (leaves), *Glycyrrhiza glabra* (root), *Smilax china* (rhizome).

Books Recommended

1. Aeri, V., Narayana, D. B. A., & Singh, D. (2019). *Powdered crude drug microscopy of leaves and barks*. Elsevier Science.
2. Gokhale, S. B., Kokate, C. K., & Ali. (2008). *Practical Pharmacognosy*. Nirali Prakashan.
3. Mukherjee, P. K. (2002). *Quality control of herbal drugs: An approach to evaluation of botanicals* (1st ed.). Business Horizons.
4. Shaheen, S., Ramzan, S., Khan, F., & Ahmad, M. (2019). *Adulteration in herbal drugs: A burning issue*. Springer Nature.
5. Zafar, R., and Gandhi, N. (2021). *Practical pharmacognosy*. CBS Publishers & Distributors.

Chemical Pharmacognosy-II

PHG-511
Cr. Hrs. 3

1. Alkaloids

Introduction, classification, biosynthesis, extraction and isolation of alkaloids. Sources, physical features, chemical composition, medicinal and pharmaceutical uses of Pyridine *(Nicotiana tabacum)*, Piperidine *(Nicotiana tabacum)*, Tropane *(Hyocyamus, Atropa, Datura stramonium)*, Imidazole *(Pilocarpus microphyllus)*, Isoquinoline *(Cephalis ipecacuanha, Chondrodendron tomentosum, Papaver somniferum)*, Quinoline *(Cinchona succirubra)*, Indole *(Claviceps purpurea, Rauwolfia serpentina, Catharanthus roseus, Strychnos nux-vomica)*, Purine *(Thea sinensis)*, Steroidal *(Veratrum viride)*, Diterpene *(Aconitum napellus)*, Phenethylamine *(Ephedra sinica, Colchicum autumnale)* alkaloids.

2. **Glycosides**
   Introduction, classification, biosynthesis, extraction and isolation of glycosides. Sources, physical features, chemical composition, medicinal and pharmaceutical uses of glycosides from *Cascara sagrada, Cassia senna, Aloe barbadensis* (anthraquinone glycosides); *Ginkgo biloba* (flavonoid glycosides); *Dioscorea spp., Smilax spp.* (steroidal saponin); *Glycyrrhiza glabra* (flavonoid glycosides, triterpenoidal saponins); *Panax ginseng,* (steroid glycosides, triterpenoidal saponins).

3. **Methods of Extraction and Isolation of Natural Products**
   Introduction to extraction, mechanism and factors affecting extraction. Methods of extraction, their advantages and disadvantages. Classic methods: infusion, decoction, percolation, maceration, digestion, distillation; Modern methods: Supercritical fluid extraction method, continuous hot extraction, Soxhlet extraction, counter current extraction, microwave assisted extraction, ultrasonication assisted extraction, enzyme assisted extraction, Pressurized liquid extraction.
   Methods of Purification: crystallization, sublimation, distillation, precipitation, chromatography.

4. **Chromatography**
   Introduction and modes of chromatography: adsorption, partition, size exclusion, ion-exchange, affinity. Types of chromatography: column chromatography, thin layer chromatography, paper chromatography, LC-MS, droplet counter current chromatography, HPLC, Gas chromatography, ion-exchange, size exclusion and affinity chromatography, their assembly/Instrumentation, methodology, principle of separation and application for the separation, isolation, purification and identification of natural products.

5. **Characterization of Natural Products**
   Characterization of natural products by spectroscopic techniques (Atomic absorption, Circular dichroism, FTIR, IR, Mass, NMR, UV, UV/Vis, X-ray spectroscopy and hyphenated techniques.

Books Recommended

1. Evans, W. C., & Evans, D. (Eds.). (2009). *Trease and Evans Pharmacognosy* (17th ed.). Saunders Elsevier.
2. Chemat, F., & Strube, J. (Eds.). (2015). *Green extraction of natural products: Theory and practice* (1st ed.). Wiley-VCH.
3. Heinrich, M., Barnes, J., Gibbons, S., Williamson, E. M., & Prieto-Garcia, J. (2018). *Fundamentals of pharmacognosy and phytotherapy* (3rd ed.). Elsevier Health Sciences.
4. Miller, J. M. (2009). Chromatography: *Concepts and contrasts* (2nd ed.). Wiley-Interscience.
5. Sarker, S. D., & Nahar, L. (Eds.). (2012). *Natural products isolation* (3rd ed., Methods in Molecular Biology, Vol. 864). Springer.

Advance Pharmacognosy

PHG-611
Cr. Hrs. 3

1. **Allergens and Allergenic Preparations**
   Introduction, atopy, types of hypersensitivity, classification of allergens, causes, history, Allergy tests (allergy skin testing, blood tests, spirometry, food challenges, drug/medication challenge, aspirin desensitization, patch testing), treatment of allergies (antihistamines, decongestants, nasal steroids, asthma medicines and immunotherapy), and method of preparation of allergy vaccines. Types of allergens on the basis of contact site: inhalant, ingestant, injectant, contactant, infectant and infestant.

2. **Enzymes**
   Introduction, classification, chemistry and functions of plant, animal and microbial enzymes; pharmaceutical, therapeutic and diagnostic importance of enzymes. Study source and uses of L-arginase, asparaginase, bromelains, chymopapain, collagenase, fibrinolysin, glucosidase, hyaluronidase, β-lactamase, papain, pancreatin, pepsin, malt extract, streptokinase, superoxide dismutase, trypsin, urokinase.

3. **Anticancer, Anti-AIDS, Immunomodulators**
   Introduction to anticancer agents of natural origin: *Catharanthus roseus, Colchicum autumnale, Podophyllum peltatum, Taxus brevifolia,* anthracyclines (daunorubicin, doxorubicin), bleomycin, dactinomycin, mitomycin c, macrolide antibiotics (erythromycin, clarithromycin).
   Potential anti-AIDS agents: alkaloid (castanospermine), anthraquinone (hypericin), coumarins (calanolides A and B), dimeric sesquiterpene (gossypol), flavonoids (glycyrrhizoflavone, isolicoflavonol, licochalcone), pentacyclic triterpene (glcyrrhizin), tannins (tetragalloylquinic acid).

Potential immunomodulators: capsaicinoid (capsaicin), diarylheptanoid (curcumin), diterpene lactone (andrographolide), flavonols (epigallocatechin-3-gallate, quercetin), isoflavones (genistein), phenethylisoquinoline (colchicine), stilbenes (resveratrol).

4. **Hormones**
Introduction, chemical classification, commercial production, extraction and isolation of animal hormones. Therapeutic/ medicinal value of peptide and amino acid derivatives: adrenaline, nor adrenaline (adrenal gland), thyroxine, triiodothyronine, calcitonin (thyroid), vasopressin, oxytocin (pituitary), parathyroid hormone (parathyroid), insulin, glucagon (pancreas); Steroidal hormones: glucocorticoids, mineralocorticoids (adrenal gland), ovaries (progestogens, estrogens), testes (androgens).
Plant hormones: auxins, gibberellin, cytokinins, abscisic acid and their significance in the development of plants and their secondary metabolites.

5. **Nutraceuticals**
Introduction, classification, regulatory and market aspects of nutraceuticals. Source, chemistry, toxicity, side effects, role in healthcare system of: cranberry extract, chitosan, chlorella, chondroitin, co-enzyme Q, flavonoids, flax seed oil, fluoride, garlic, isoflavones, kelp, lecithin, lignans, lycopene, pre- and pro- biotics, phytoestrogens, royal jelly, selenium, spirulina and zinc as nutraceuticals.

6. **Cosmeceuticals**
Introduction, classification of cosmeceuticals as skin, eye, hair care and others products. Natural source, isolated products, chemistry, uses, toxicity and the use in cosmeceuticals based on aloe, apricot, argan oil, arnica, balsam, bromelain, calendula, chamomile, coconut, cucumber, henna, honey, jojoba, lavender, myrrh, oats, pomegranate, propolis, rosemary, tea, turmeric and walnut.

Books Recommended

1. Tyler, V. E., Brady, L. R., & Robbers, J. E. (1988). *Pharmacognosy* (9th ed.). Lea and Febiger.
2. McGrath, B. M., & Walsh, G. (2005). *Directory of therapeutic enzymes* (1st ed.). CRC Press.
3. Cragg, G. M., Kingston, D. G. I., & Newman, D. J. (2005). *Anticancer agents from natural products*. CRC Press.
4. Rao, Y. M., & Shayeda. (2012). *Cosmeceuticals*. BS Publications.
5. Wildman, R. E. C., & Bruno, R. S. (Eds.). (2019). *Handbook of nutraceuticals and functional foods* (3rd ed.). CRC Press.

Clinical Pharmacognosy

PHG-713
Cr. Hrs. 2

1. **Introduction to Clinical Pharmacognosy**
Introduction and historical background of Clinical Pharmacognosy. Study of causes, pathogenesis, clinical features (sign and symptoms), diagnosis, prognosis, prevention and epidemiology of chronic diseases; principles of medication; treatment of diseases by herbal medicines.

2. **Clinical Use of Herbal Medicine**

CNS disorders
Atropa belladonna, Cannabis sativa, Datura stramonium, Hypericum perforatum, Papaver somniferum, Strychnos nux-vomica.

Cardiovascular diseases
Allium sativum, Crataegus monogyna, Convallaria majalis, Digitalis purpure, D. lanata, Punica granatum, Urgenia indica.

Hepatic disorders
Berberis vulgaris, Chelidonium majus, Lawsonia innermis, Picrorhiza kurroa, Silybum marianum.

Renal disorders
Berberis vulgaris, Cucumis melo, Serenoa repens, Tribulus terrestris, Urtica dioica, Zea mays.

Pulmonary diseases
Adhatoda vasica, Althaea officinalis, Andrographis paniculate, Eucalyptus globulus, Ficus religiosa.

G.I.T. disorders
Aegle marmelos, Cuminum cyminum, Ferula foetida, Foeniculum vulgare, Mentha piperita, Prunus domestica.

Metabolic disorder: Diabetes
Caesalpinia bonducella, Galega officinalis, Gymnema sylvestre, Melia azadirchta, Momordica charantia, Syzygium jambulana

Musculo-skeletal disorders
Ananas comosus, Capsicum annum, Curcuma longa, Nigella sativa, Phycotis ajowan, Rosemarinus officinalis, Trigonella foenum-graecum, Zingiber officinale.

Reproductive disorders
Angelica polymorpha Maxim. var. sinensis, Claviceps purpurea, Glycyrrhiza glabra, Myristica fragrans, Nigella sativa, Ruta graveolens, Saraca indica.

Dermal disorders
Aloe vera, Angelica archangelica, Argania spinosa, Citrus spp., Commiphora mukul, Melaleuca alternifolia, Mentha piperita.

Books Recommended

1. Bone, K., & Mills, S. (2013). *Principle and practice of phytotherapy:* Modern herbal medicine. Churchill Livingstone.
2. Mandal, S. C., Chakraborty, R., & Sen, S. (2021). *Evidence based validation of traditional medicines: A comprehensive approach* (1st ed.). Springer Singapore.
3. Samuelsson, G., & Bohlin, L. (2015). *Drugs of natural origin: A treatise of pharmacognosy* (7th ed.). Swedish Pharmaceutical Press.
4. Schulz, V., Hänsel, R., & Tyler, V. E. (1996). *Rational phytotherapy: A physician's guide to herbal medicine* (3rd ed.). Springer-Verlag.
5. Zhang, L., & Demain, A. L. (Eds.). (2005). *Natural products: Drug discovery and therapeutic medicine*. Humana Press.

Second Semester

General Pharmacognosy

PHG-312
Cr. Hrs. 3

1. **Historical Development and Scope of Pharmacognosy in Modern Medicine**
Introduction and history of Pharmacognosy with special reference to the contribution of Muslim scientists (Hunayn bin Ishaq, Ali Ibn Sahl at-Taberi, Al-Razi, Al-Biruni, Ibn Sina, Ibn al-Baitar, Al-Nafis, Al-Idrisi, Al-Kindi) to the profession of Pharmacy. Introduction to herbal pharmacopoeias and prospects of Pharmacognosy in modern medicine, Complementary and Alternative Medicine (CAM).

2. **Crude Drugs**
Introduction to crude drugs, classifications of crude drugs: alphabetical, morphological, taxonomical, chemical and therapeutic classification, their preparation and commerce. Official and un-official drugs.

3. **Drugs of Natural Origin**
Plant Drugs: Source, chemical nature, medicinal and pharmaceutical uses of *Ephedra sinica, Glycyrrhiza glabra, Cassia angustifolia, Laminaria spp., Sargassum spp.*
Animal drugs: Source, chemical nature and medicinal/ pharmaceutical uses of honey, gelatin, shellac, musk, civet, ambergris, cod liver oil, cantharides and spermaceti.
Mineral drugs: Sulphur, Alum, Borax, Magnesium salts, Aluminium hydroxide, Sodium bicarbonate.
Natural Fibers: Sources, classification of fibers as vegetable, animals and mineral fibers and their identification tests. Source, chemical nature and uses of cotton, wool, cellulose and catgut.

4. **Biologics**
   Introduction to biologics and their types: vaccines, blood and its components, antisera, toxins, antitoxins, venoms, antivenins, cells, allergens, genes, tissues, and recombinant protein.
   Types of Vaccines: Live-attenuated, inactivated, subunit, recombinant, polysaccharide and conjugated.
   Preparation and uses of: tuberculosis, poliomyelitis, diphtheria, tetanus, pertussis, hepatitis B, haemophilus influenzae type b (Hib), pneumonia, meningitis, measles mumps and rubella (MMR), diarrhea, chicken pox, herpes zoster, human papillomavirus (HPV), rabies, typhoid, Covid-19 vaccines, toxins, antitoxins, venoms, antivenins, antisera.
   The Expanded Program on Immunization (EPI) in Pakistan.

5. **Quality Control and Standardization of Plant Drugs**
   Introduction to quality control and standardization of plant drugs. Difference between standardized crude drug and standardized crude extract. Types of quality control methods: physical, chemical and biological. Types of adulteration, inferiority, spoilage, admixture, sophistication and substitution of crude drugs. WHO guidelines for standardization of plant drugs and its significance.

Books Recommended

1. Tyler, V. E., Brady, L. R., & Robbers, J. E. (1988). *Pharmacognosy* (9th ed.). Lea and Febiger.
2. Evans, W. C., Trease, G. E., & Evans, D. (2009). *Trease and Evans' pharmacognosy* (16th ed.). Elsevier.
3. Delgoda, R., & Badal Mccreath, S. (Eds.). (2016). *Pharmacognosy: Fundamentals, applications and strategies* (1st ed.). Academic Press.
4. Heinrich, M., Williamson, E. M., Gibbons, S., Barnes, J., & Prieto-Garcia, J. (2018). *Fundamentals of pharmacognosy and phytotherapy* (3rd ed.). Elsevier Health Sciences.
5. Ravina, E., & Kubinyi, H. (2011). *The evolution of drug discovery: From traditional medicines to modern drugs*. John Wiley & Sons.
6. Zollman, C., Vickers, A. J., & Richardson, J. (Eds.). (2009). *ABC of complementary medicine* (Vol. 92, 2nd ed.). John Wiley & Sons.

Chemical Pharmacognosy-I

PHG-412
Cr. Hrs. 3

1. **Carbohydrates and Related Compounds**
   Introduction and classification of carbohydrates. Uses of carbohydrates as medicinal agent or pharmaceutical aid: source, physical features, chemistry, uses and method of extraction of dextrose, fructose, sorbitol/glucitol, xylitol, mannose/ mannitol, sucrose, maltose, lactose, starch, cellulose, pectin, tragacanth gum, guar gum, agar, alginic acid, carrageenan, laminarin, fucoidan.

2. **Fats and Fixed Oils**
   Introduction, classification; extraction and quality control methods of fixed oils and fats. Sources, physical features, chemical composition, medicinal and pharmaceutical uses of castor oil, cotton seed oil, olive oil, peanut oil, sesame oil, sunflower oil, corn oil, coconut oil, almond oil, flax seed oil, canola oil, soya oil. chaulmoogra oil, mustard oil, palm oil, lanolin, carnaubas wax and bee wax.

3. **Volatile Oils**
   Introduction, classification, biosynthesis and extraction methods of volatile oils. Sources, physical features, chemical composition, medicinal and pharmaceutical uses of clove oil, fennel oil, coriander oil, orange oil, eucalyptus oil, peppermint oil, anise oil, turpentine oil, lemon peel oil, citronella oil, caraway oil and thyme oil.

4. **Resins and Oleoresins**
   Introduction and classification of resins and oleo resins. Sources, physical features, chemical composition, medicinal and pharmaceutical uses of jalap, turpentine, asafoetida, benzoin, rosin, cannabis, podophyllum, ipomea, myrrh and balsam.

5. **Tannins**
   Introduction, classification, extraction and identification of tannins. Source, physical features, chemical composition, medicinal and pharmaceutical uses of tannins found in *Acacia catechu, Camellia sinensis, Castanea sativa, Krameria triandra, Pterocarpus marsupium, Punica granatum, Quercus infectoria and Terminalia chebula.*

4. Steroids
Introduction, classification, biosynthesis, extraction and isolation of steroids. Sources, physical features, chemical composition, and medicinal uses of bile acids, plant sterols *(Glycine max)*, cardiac glycosides *(Digitalis purpurea, Digitalis lanata, Convallaria majalis, Strophanthus kombe, Urginea maritima, Nerium oleander)*, vitamin D and withanolides.

Books Recommended

1. Tyler, V. E., Brady, L. R., & Robbers, J. E. (1988). *Pharmacognosy* (9th ed.). Lea and Febiger.
2. Evans, W. C., Trease, G. E., & Evans, D. (2009). *Trease and Evans' pharmacognosy* (16th ed.). Elsevier.
3. Heinrich, M., Williamson, E. M., Gibbons, S., Barnes, J., & Prieto-Garcia, J. (2018). *Fundamentals of pharmacognosy and phytotherapy* (3rd ed.). Elsevier Health Sciences.
4. Petridis, G. K. (2011). *Tannins: Types, foods containing, and nutrition*. Nova Science Publishers.
5. Samuelsson, G., & Bohlin, L. (2015). *Drugs of natural origin: A treatise of pharmacognosy* (7th ed.). Swedish Pharmaceutical Press.
6. Seth, A., & Shah, B. (2010). *Textbook of pharmacognosy and phytochemistry* (1st ed.). Elsevier India.

Herbal Quality Control Lab-II

PHG-512
Cr. Hrs. 3

1. Extraction, Isolation and identification of Natural Products
i. Extraction and isolation of starch from the tubers of *Solanum tuberosum*.
ii. Identification of starch isolated from tubers of *Solanum tuberosum* by chemical methods.
iii. Extraction and isolation of pectin from the inner pericarp of *Citrus paradisi* fruit.
iv. Identification of pectin isolated from the inner pericarp of *Citrus paradisi* fruit by chemical method.
v. Extraction and isolation of caffeine from *Thea sinensis* leaves.
vi. Extraction and isolation of piperine from *Piper nigrum* fruits.
vii. Extraction and isolation of myristicin and trimyristicin from *Myristica fragrans* seed.
viii. Extraction and isolation of Lycopene and β-Carotene from *Solanum lycopersicum* fruits.
ix. Extraction of volatile oil from plant sources by distillation methods:
Myristica fragrans, Trachyspermum ammi, Eugenia caryophyllus, Carum carvi
x. Identification of volatile oils by pharmacopeial methods.
xi. Extraction of fixed oil by solvent extraction method (Soxhlet).
(Sesamum indicum, Arachis hypogea, Prunus amygdalus var. amara)
xii. Analysis of oils adulterated with Sesame seed oil by Baudouin test.
xiii. Analysis of oils adulterated with Castor seed oil by chemical methods.
xiv. Determination of saponification value, iodine number, acid number and peroxide value of the fixed oils.
(Sesamum indicum, Arachis hypogea, Prunus amygdalus var. amara)

2. Preliminary Screening of Natural Products
i. Detection of carbohydrates, tannins, alkaloids, glycosides, steroids, saponins, terpenes and flavonoids in the following plant extracts by chemical reagents:
Camellia sinensis, Cassia senna, Cassia fistula, Cordia myxa, Datura stramonium, Glycyrrhiza glabra, Strychnos nux-vomica, Sapindus trifoliatus, Uncaria gambir.

3. Chromatography
i. Identification of caffeine isolated from *Thea sinensis* leaves by T.L.C method.
ii. Identification of piperine from *Piper nigrum* fruits by T.L.C method.
iii. Identification of myristicin and trimyristicin isolated from *Myristica fragrans* seed by T.L.C method.
iv. Identification of Lycopene and β-Carotene isolated from *Solanum lycopersicum* fruit by T.L.C method.
v. Separation of color pigments from *Bougainvillea glabra* flower petals buy column chromatography.
vi. Qualitative and quantitative assessment of glycyrrhizin present in the root extract of *Glycyrrhiza glabra* by HPLC.
vii. Characterization of Flavonoids present in medicinal plants by Thin Layer Chromatography *(Ruta graveolens herb, Matricaria chamomilla flowers, Carum carvi fruit)*.
viii. Analysis of *Digitalis purpurea* leaf extract of by paper chromatography.
ix. Determination of the color pigments present in leaf extract by T.L.C. method.
x. Analysis of *Strychnos nux-vomica* extract (acid or alkaline) for the presence of strychnine and brucine by thin layer chromatography (TLC).
xi. Determination of ephedrine in *Ephedra sinica* stem through ion exchange chromatography.

xii. Separation of alkaloids from an extract of *Atropa belladonna* through ion exchange chromatography.
xiii. Characterization of herbal extracts of the following drugs by TLC /HPTLC Finger Printing. *(Aegle marmelos, Aloe spp., Cassia senna, Ocimum tenuiflorum, Phyllanthus emblica, Withania somnifera).*

4. Spectroscopy
i. Analysis of Pharmacopeial compounds of natural origin and plant extracts by UV-Vis spectrophotometer.
ii. Authentication and identification of crude drugs extract by fluorescence analysis.

Books Recommended

1. Chemat, F., & Strube, J. (Eds.). (2015). *Green extraction of natural products: Theory and practice* (1st ed.). Wiley-VCH.
2. Clarke, E. G. C., & Moffat, A. C. (1975). *Clarke's isolation and identification of drugs*. Pharmaceutical Press.
3. Heftmann, E. (1983). *Chromatography: Fundamentals and applications of chromatographic and electrophoretic methods. Part A, Fundamentals and techniques*. Elsevier Scientific Publishing Company.
4. Poole, C. (2002). *The essence of chromatography* (1st ed.). Elsevier Science.
5. Sarker, S. D., & Nahar, L. (Eds.). (2012). *Natural products isolation: Methods and protocols* (3rd ed.). Springer.
6. Stahl, E. (1969). *Thin-layer chromatography: A laboratory handbook*. Springer-Verlag.

Natural Toxins

PHG-514
Cr. Hrs. 2

1. Introduction to Natural Toxins
Introduction, classification and chemical nature of natural toxins, their toxicities in humans and animals and their applications.

2. Higher Plant Toxins
Essential oils: Terpene (cineol, pine oil), Phenylpropane (apiol, safrole, myristicin), Monoterpene (thujone, menthafuran), Plant acids (oxalic acid, amino acid, resin acid), Glycosides (cardiotonic, cyanogenic), Alkaloids (imidazole, pyrrolizidine, tropane), Lectin *(Abrus precatorius, Ricinus communis)*, Pyridine/piperidine *(Conium maculatum, Lobelia inflata),* Steroidal alkaloids *(Veratrum album).*

3. Lower Plant Toxins
Bacterial toxins *(Staphylococcus aureus, Clostridium botulinum),* Algal toxins *(Microcystis aeruginosa, Cyanobecteria, Gonyaulax cantenella).*

4. Mycotoxins
Fungal toxins *(Aspergillus spp., Claviceps purpurea),* Mushrooms *(Amanita spp.).*

5. Animal Toxins
Honey bee *(Apis mellifera),* black widow spider *(Latrodectus mactans),* Snake venom *(Bothrops Jararaca, Naja nana atra),* Scorpion *(Scorpiones spp.),* Gila monster lizard *(Heloderma suspectum),* Snail *(Conus magus).*

6. Prevention and Control Methods of Toxins
Description, pharmacognostic features, pharmacological actions, chemical constituents, treatment, side-effects, contra-indications, warnings, prevention and control methods of *Abrus precatorius, Apis mellifera, Bungarus sindanus, Datura stramonium, Digitalis purpurea, Latrodectus mactans, Nicotiana tabaccum,* and *Papaver somniferum* poisoning.

Books Recommended

1. Askari, S. H. A. (2010). *Poisonous plants of Pakistan*. Oxford University Press.
2. Forhne, D., & Pfander, H. J. (2005). *Poisonous plants: A handbook for doctors, pharmacists, toxicologists, biologists and veterinarians* (2nd ed.). Manson Publishing.
3. Gopalakrishnakone, P., Carlini, C. R., & Ligabue-Braun, R. (Eds.). (2017). *Plant toxins* (1st ed.). Springer.
4. Gopalakrishnakone, P., Stiles, B., Alape-Girón, A., Dubreuil, J. D., & Mandal, M. (Eds.). (2018). *Microbial toxins* (1st ed.). Springer.
5. Hildebrandt, J.-P., Teuscher, E., & Lindequist, U. (2023). *Natural poisons and venoms: Animal toxins* (Vol. 4). Walter de Gruyter. https://doi.org/10.1515/9783110728552
6. Mtewa, A. G., Egbuna, C., & Rao, G. M. N. (Eds.). (2020). *Poisonous plants and phytochemicals in drug discovery.* John Wiley & Sons Ltd.

English (Compulsory)

1. Parts of speech and articles
2. Verb – Transitive and intransitive verbs
3. Active and passive voice
4. Modal verbs
5. Skimming and scanning
6. Precise writing and comprehension
7. Letter writing
8. Memo
9. Minutes of the meeting
10. How to write research proposals + term papers
11. Presentation skills
12. Technical writing
13. Note – taking
14. Essay writing

Books Recommended

1. Bullock, R., & Goggin, M. D. (Eds.). (2025). *The Norton field guide to writing with readings* (7th ed.). W. W. Norton & Company.
2. Ferrari, B. T. (2012). *Power listening: Mastering the most critical business skill of all*. Portfolio/Penguin.
3. Garcia, H. F. (2012). *The power of communication: Skills to build trust, inspire loyalty, and lead effectively*. FT Press.
4. Lucas, S. E. (2015). *The art of public speaking* (12th ed.). McGraw-Hill Education.
5. Murphy, R. (2019). *English grammar in use* (5th ed.). Cambridge University Press.
6. Swan, M. (2016). *Practical English usage* (4th ed.). Oxford University Press.
7. Thomson, A. J., & Martinet, A. V. (1986). *A practical English grammar* (4th ed.). Oxford University Press.
8. Tyson, L. (2006). *Critical theory today: A user-friendly guide* (2nd ed.). Routledge.
9. Wren, P. C., & Martin, H. (2000). *High school English grammar and composition*. S. Chand Publishing.

Pharm. D. (Deficiency) Program

1st Semester			2nd Semester		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHG - 713(D)	Clinical Pharmacognosy	2	PHG- 514(D)	Natural Toxicants	2
Total **02** Courses making **04** Credit Hours in five years					

First Semester

Clinical Pharmacognosy

PHG-713(D)
Cr. Hrs. 2

1. **Introduction to clinical Pharmacognosy**
   General introduction and historical background of clinical Pharmacognosy. Study of causes, pathogenesis, clinical features (sign and symptoms), diagnosis, prognosis, prevention and epidemiology of chronic diseases; principles of medication, treatment by herbal medicines.

2. **Clinical Use of herbal medicine**
   Diabetes: *Gymnema sylvestre, Melia azadirchta, Momordica charantia, Syzygium jambulana.*
   Cardiac diseases: *Digitalis spp., Convallaria majalis, Urgenia indica, Allium sativum, Punica granatum.*
   Hepatitis: *Berberis vulgaris, Picrorhiza kurroa, Lawsonia innermis.*
   Respiratory diseases: *Ficus religiosa, Adhatoda vasica.*
   Skin diseases: *Aloe vera, Angelica archangelica, Mentha piperita, Citrus spp., Commiphora mukul.*
   CNS disorders: *Strychnos nux-vomica, Datura stramonium, Cannabis sativa, Papaver somniferum, Atropa belladonna.*
   Musculo-skeletal disorders: *Nigella sativa, Phycotis ajowan, Trigonella foenum-graecum, Zingiber officinale.*
   Renal disorders: Cucumis melo, Berberis vulgaris, Zea mays, Tribulus terrestris.
   Reproductive disorders: *Saraca indica, Ruta graveolens, Nigella sativa, Glycyrrhiza glabra, Claviceps purpurea, Myristica fragrance.*
   G.I.T. disorders: *Foeniculum vulgare, Ferula foetida, Cuminum cyminum, Aegle marmelos, Prunus domestica.*

Books Recommended

1. Bone, K., & Mills, S. (2013). *Principles and practice of phytotherapy: Modern herbal medicine* (2nd ed.). Churchill Livingstone.
2. Pullaiah, T. (2006). *Encyclopedia of world medicinal plants* (Vol. 5). Regency Publications.
3. Williamson, E. M., Okpako, D. T., & Evans, F. J. (1996). *Pharmacological methods in phytotherapy research: Selection, preparation and pharmacological evaluation of plant material* (Vol. 1). Wiley.
4. Yadav, A. V., Yadav, B. V., & Shaikh, T. I. (2008). *Handbook of clinical pharmacy.* Nirali Prakashan.
5. Zhang, L., & Demain, A. L. (Eds.). (2005). *Natural products: Drug discovery and therapeutic medicine*. Humana Press.

Second Semester

Natural Toxicants

PHG-514(D)
Cr. Hrs. 2

1. **General introduction to plant toxicology**
   Classification and chemical nature of natural toxins and toxicities in humans and animals.

2. **Higher plant toxins**
   Essential oils: Terpene (cineol, pine oil), Phenyl propane (apiol, safrole, myristicin), Monoterpene (thujone, menthafuran) Plant acids (oxalic acid, amino acid, resin acid), Glycosides (cardiotonic, cyanognic glycosides), Alkaloids (imidazole, pyrrolizidine, tropane).

3. **Lower plant toxins**
   Bacterial toxins *(Staphylococcus aureus, Clostridium botulinum),* Algal toxins *(Microcystis aeruginosa, Cyanobecteria, Gonyaulax cantenella).*

4. **Mycotoxins**
   Fungal toxins *(Aspergillus spp., Claviceps purpurea),* Mushrooms *(Amanita spp.).*

5. **Study of toxins, their prevention and control methods**
   Description, pharmacognostic features, pharmacological actions, chemical constituents, treatment, side-effects, contra-indications, warnings, prevention and control methods of *Abrus precatorius, Papaver somniferum, Eucalyptus* spp., *Nicotiana tabaccum, Cannabis sativa, Digitalis purpurea, Datura stramonium* poisoning.

Books Recommended

1. Askari, S. H. A. (2010). *Poisonous plants of Pakistan*. Oxford University Press.
2. Forhne, D., & Pfander, H. J. (2005). *Poisonous plants: A handbook for doctors, pharmacists, toxicologists, biologists and veterinarians* (2nd ed.). Manson Publishing.
3. Gopalakrishnakone, P., Carlini, C. R., & Ligabue-Braun, R. (Eds.). (2017). *Plant toxins* (1st ed.). Springer.
4. Gopalakrishnakone, P., Stiles, B., Alape-Girón, A., Dubreuil, J. D., & Mandal, M. (Eds.). (2018). *Microbial toxins* (1st ed.). Springer.
5. Hildebrandt, J.-P., Teuscher, E., & Lindequist, U. (2023). *Natural poisons and venoms: Animal toxins* (Vol. 4). Walter de Gruyter. https://doi.org/10.1515/9783110728552
6. Mtewa, A. G., Egbuna, C., & Rao, G. M. N. (Eds.). (2020). *Poisonous plants and phytochemicals in drug discovery.* John Wiley & Sons Ltd.

Faculty of **Pharmacy and Pharmaceutical Sciences**

Department of Pharmacy Practice

Message from the Coordinator

Dear Students,

As the Professor and Coordinator of the Department of Pharmacy Practice, I warmly welcome you to our Pharm.D. program. Pharmacy practice is the cornerstone of modern healthcare, bridging scientific knowledge with patient care to optimize medication use and improve healthcare outcomes. Our curriculum emphasizes clinical teaching covering hospital and community pharmacy and clinical and mandatory, hands-on training in hospitals and community pharmacies, across the city, where you will be able to gain knowledge with real-time patients in hospitals under supervision of registered pharmacists learning pharmacotherapy—applying evidence-based medication management to treat diverse patient needs. These experiences will enhance your skills in real-world settings, preparing you to deliver impactful care. Furthermore, we are dedicated to building a strong network with practicing experts across Karachi, connecting you with professionals to enrich your learning and career prospects. I assure you that our team will always be to facilitate you in this regard. Take this opportunity to become compassionate, skilled pharmacists who make a difference, nationwide and internationally!

Sincerely,

Prof. Dr. Iyad Naeem Muhammad

Department of **Pharmacy Practice**

As there was an international paradigm shift in the pharmacy orientation from pill to patient, the regulatory body for pharmacy profession, Pharmacy Council of Pakistan had to revisit its curricula. As a result of which, a department of Pharmacy Practice was added peculiarly to focus on the pharmaceutical care practices. Pharmacy practice department in the faculty of Pharmacy and Pharmaceutical Sciences aims to impart and acquaint the students of pharmacy to the standards of practices in pharmaceutical care to obtain the best therapeutic outcomes in order to improve the patient's quality of life. The courses in the department emphasizes on right from the basics of the health in a society to a complex direct patient care at the patients' bed side. It includes the fundamentals of the pharmacy practice, introduces the students to the practice aspects and explore the insights of the practical approach that covers medication error reporting, Adverse Drug Reactions, Drug interactions, Therapeutic Drug Monitoring, institutional and non-institutional pharmacy practices.

The need of the real time practices is also part of the curricula that requires the students to get involved in trainings, internships and clerkships in hospital setups. To meet the demand of the courses, faculty of pharmacy and pharmaceutical sciences has signed MoUs with several tertiary care general and specialist hospitals of the city where the students would learn the aspects by practicing under the supervision of skilled professionals.

The mission statement of the Department of Pharmacy Practice is to produce highly qualified pharmacists, for Hospital, Community setups, researchers and leaders able to manage in diverse environments and to ultimately improve health in the society.

The Department of Pharmacy Practice, as a future perspective, will not only produce competent pharmacists but will also proceed with the vision of active research in different areas of Pharmacy Practices by offering post graduate programs.

Contact Details

Phone: (+92-21) 99261100
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Website: www.uok.edu.pk/faculties/pharmacypractice/index.php

Vision and Mission Statement

• Vision

"To emerge as a nationally and internationally acclaimed center of excellence in pharmacy practice education, research, and professional service; dedicated to the development of competent, ethical, and innovative pharmacists who will advance patient care, promote the rational use of medicines, and contribute meaningfully to the improvement of public health and the healthcare system at large."

• Mission

"The Department of Pharmacy Practice, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, is committed to providing high-quality education and training through innovative pedagogy, evidence-based practice, and experiential learning. We aim to foster professional integrity, and a culture of lifelong learning among our students. Through impactful research, interprofessional collaboration, and community engagement, we strive to address healthcare challenges, enhance pharmaceutical services, and promote safe, effective, and fair access to pharmaceutical care for all."

Group Photo of the Department

Sitting, from L to R: Ms. Ayesha Kamal, Prof. Dr. Iyad Naeem Muhammad, Prof. Dr. Muhammad Harris Shoaib, Prof. Dr. Rabia Ismail Yousuf.

Standing, from L to R: Dr. Mohammad Osama, Mr. Muhammad, Umer Gilani.

Dr. Iyad Naeem Muhammad

Designation: **Professor**
Qualification: **Ph.D., M.Phil., B.Pharm. (University of Karachi)**
Year of Association: **2006**
Email: **iyadnaeem@uok.edu.pk**
Phone: **(+92-21) 99261100, +92-3332361360**

Dr. Iyad Naeem joined the Faculty of Pharmacy in 2006, after over five years' experience as a hospital pharmacist. He holds a Ph.D. in Pharmaceutics from University of Karachi, specializing in formulation development, optimization, and population pharmacokinetics, along with an M.Phil. focusing on antimicrobial resistance and nosocomial infections. Currently he is Professor, teaching undergraduate and postgraduate courses in Dosage Forms, Pharmaceutical Quality Control, Forensic Pharmacy, and Hospital Pharmacy. His research interests include Pharmaceutical Microbiology, Formulation Development, and Pharmacy Practice, and he has supervised numerous graduate students in related fields.

Board of Studies

Dr. Muhammad Harris Shoaib
Professor and Dean, (In-Chair)
Faculty of Pharmacy & Pharmaceutical Sciences,
University of Karachi.

Dr. Faiyaz HM Vaid
Professor and Chairman,
Department of Pharmaceutical Chemistry
University of Karachi.

Dr. Muhammad Mohtasheem ul Hasan
Professor and Chairman,
Department of Pharmacognosy,
University of Karachi.

Dr. S.M. Farid Hassan
Professor and Chairman,
Department of Pharmaceutics
University of Karachi.

Dr. Afshan Siddiq
Professor and Chairperson,
Department of Pharmacology
University of Karachi.

Dr. Rabia Ismail
Professor
Department of Pharmaceutics/Pharmacy Practice
University of Karachi.

Dr. Iyad Naeem Mohammad
Professor and Coordinator
Department of Pharmacy Practice
University of Karachi.

Dr. Muhammad Ali Sheraz
Professor, Chairman and Director
Department of Pharmacy Practice
Baqai Institute of Pharmaceutical Sciences,
Baqai Medical University, Karachi.

Dr. Arif Sabah
Associate Professor and Chairman
Department of Pharmacy Practice
Faculty of Pharmacy
Ziauddin University, Karachi

Dr. Sadaf Naeem
Head of the Department
Department of Pharmacy Practice
Institute of Pharmaceutical Sciences
Jinnah Sindh Medical University

Samina Badar, R.Ph.
Manager Pharmacy
Shaukat Khanum Memorial Cancer Hospital
KDC&C, Karachi

Pharm. D. Courses

Fourth Professional					
1st Semester			**2nd Semester**		
Course NO.	**Title of Course**	**Cr. Hrs.**	**Course N0.**	**Title of Course**	**Cr. Hrs.**
PHP-601	Pharmacy Practice - Hospital Pharmacy	3	PHP-602	Pharmacy Practice- Community, Social and Administrative Pharmacy	3
Fifth Professional					
PHP-705	Pharmacy Practice - Clinical Pharmacy	3	PHP-714	Pharmacy Practice - Pharmacotherapeutics	3

Total **04** Courses making **12** Credit Hours in five years

Pharm. D. Courses – Outline
First Semester

Pharmacy Practice: Hospital Pharmacy

PHP-601
Cr. Hrs. 3

1. **Hospital and Its Organization:**
   a. Brief history of hospital
   b. Classification of hospitals
   c. Minimum requirements for registering a hospitals
   d. Organizational structure
   e. Administration
   f. Clinical departments
   g. Nursing, dietetic, pathology, blood bank, radiology and other supportive services
   h. Hospital finances

2. **Role of Pharmacy in Hospitals, Role of Pharmacist in Small Hospitals, Nursing Homes etc.**

3. **Minimum Standards for Hospital Pharmacies as per ASHP**
   Pharmacy, its organization and personnel:
   a. The Physical plant and its equipment
   b. Pharmacy specialist
   c. Drug information centre
   d. Poison control centre and antidote bank
   e. Pharmacy education, CEs and CMEs, internship program, clerkship, etc.
   f. Professional services rendered
   g. The Pharmacy: central sterile supply room (eye drops, ear drops) and hyper alimentation.
   h. Nuclear pharmacy
   i. Investigational use of drugs
   j. Health accessories, ancillary supplies and surgical supplies

4. **Dispensing to Inpatients**
   a. Methods of dispensing and SOP's
   b. Unit dose dispensing
   c. Other concepts of dispensing, satellite pharmacy etc.

5. **Dispensing to Ambulatory Patients**
6. **The Hospital Formulary System: guidelines of AHFS**
7. **Controlled Substances: Procurement, Distribution, Dispensation and Inventory Management**
8. **Dispensing During Off-Hours, Off Site Pharmacies**

9. **Purchasing, Distribution and Control of Hospital Medicines, Medical and surgical supplies**
   Supply chain management and execution: purchasing, stocking, stock control, inventory management, drug distribution, relationship between purchasing, distribution and clinical pharmacy services

10. **200 Contact Hours Hospital Pharmacy Internship in a Tertiary Care General Hospital Covering the Clinical Units.**

Books Recommended

1. Brown, T. R. (2006). *Handbook of institutional pharmacy practice*. American Society of Health-System Pharmacists (ASHP).
2. Hassan, W. E. (1986). *Hospital pharmacy* (5th ed.). Lea & Febiger.
3. Holdford, D. A., & Brown, T. R. (2010). *Introduction to hospital and health-system pharmacy practice*. American Society of Health-System Pharmacists (ASHP).
4. Stephens, M. (2011). *Hospital pharmacy*. Pharmaceutical Press.
5. Harding, G., & Taylor, K. M. G. (Eds.). (2016). *Pharmacy practice* (2nd ed.). CRC Press.
6. Thompson, J. E. (2009). *A practical guide to contemporary pharmacy practice* (3rd ed.). Williams & Wilkins

Pharmacy Practice: Clinical Pharmacy

PHP-705
Cr. Hrs. 3

1. **Rationalize Use of Drugs**
2. **Medication Errors**
3. **Drug Utilization and Drug Utilization Review**
4. **Lab Data Interpretation and Monitoring (ADR etc.)**
5. **Developing and Implementing TDM**
6. **Documentation of Pharmacotherapy Plan**
   - SOAP (Subjective, Objective, Assessment and Plan) note
   - CORE (communication, organization, relationship and expectations) pharmacotherapy plan
   - PRIME (pharmaceutical based problems, risk to patient, interactions, mismatch between medications and conditions or patients need and efficacy issues) pharmacotherapy problems
   - FARM (findings, assessment, resolution and monitoring and follow up) note

7. **Pharmacotherapy Decision Making.**
8. **Pharmaco-Economics and its Implementation**
9. **Public Health Issues and Different Models to Study e.g tobacco cessation programs, obesity prevention, tuberculosis monitoring, vaccinations etc.**
10. **CNS Unit (psychosis, stroke, epilepsy), GI Unit**
11. **Oncology Unit (solid and other cancers)**
12. **Osso Unit (bone density, rickets, osteoporosis)**
13. **Gastroenterology Unit (ulcers, cirrhosis, hepatitis etc.)**

Books Recommended

1. Ansel, H. C. (2012). *Pharmaceutical calculations* (14th ed.). Lippincott Williams & Wilkins.
2. Chisholm-Burns, M. A., Wells, B. G., Schwinghammer, T. L., Malone, P. M., Kolesar, J. M., DiPiro, J. T., & Posey, L. M. (2010). *Pharmacotherapy principles & practice* (2nd ed.). McGraw-Hill.
3. DiPiro, J., Talbert, R. L., Yee, G., Wells, B. G., & Posey, L. M. (2014). *Pharmacotherapy: A pathophysiologic approach* (9th ed.). McGraw-Hill Professional.
4. Koda-Kimble, M. A., Alldredge, B. K., Young, L. Y., Kradjan, W. A., Guglielmo, B. J., & Corelli, R. L. (2012). *Koda-Kimble and Young's applied therapeutics: The clinical use of drugs* (10th ed.). Lippincott Williams & Wilkins.
5. Lauster, C. D., & Srivastava, S. B. (2013). *Fundamental skills for patient care in pharmacy practice.* Jones & Bartlett Publishers.
6. Lexi-Comp, Inc. (2015). *Lexi-Comp Online*™ [Drug database].
7. Thompson, J. E. (2009). *A practical guide to contemporary pharmacy practice* (3rd ed.). Williams & Wilkins.

Second Semester

Pharmacy Practice: Community, Social & Administrative Pharmacy

PHP-602
Cr. Hrs. 3

1. **Definitions and background**
   Health and its types, fundamentals of health, health determinants, health care system, health care organizations and institutes, public health and community pharmacy.

2. **Epidemiology, Epidemiological Methodology with a Focus on Specific Disease States, Pharmacoepidemiology**
3. **Preventive health (EPI & CDC), Family Planning and Health Policy**
4. **Medical Complication of Drug Taking: General and Socio-Economic Aspects**
5. **Pharmacy Layout Design**
   Objectives of layout design, types of community pharmacies (pharmaceutical center, prescription-oriented pharmacies, traditional pharmacies and the super drug stores chain of pharmacies), consumer goods and purchases, classes of layout designs, principles and characteristics of layout design and traffic flow analysis.

6. **Operations in a Community Pharmacy**
   a. Procurement of drugs, medical devices, health accessories, ancillary supplies
   Good storage practices in community pharmacy
   b. Compounding and dispensing including:
   Fundamental operations in compounding, containers and closures for dispensed products.
   c. Prescription-handling (parts of prescription, filling, interpretation, pricing) and labelling of dispensed medication.
   d. Extemporaneous dispensing: solutions, suspensions, emulsions, creams, ointments, pastes and gels, suppositories and pessaries, powders and granules and oral unit dosage form.
   e. Pharmaceutical incompatibilities: types of incompatibilities, manifestations, correction and prevention with reference to typical examples.
   f. Patient education and counselling, educational role of community pharmacy
   g. Control of drug abuse and misuse in community pharmacy
7. **Role of Pharmacist: as Public Health Educator in the Community for Drug Monitoring and Drug Information**
8. **Pharmacoeconomics: pharmacoeconomic modelling and interpretation**
9. **Alternative Therapies**
   Background, philosophy and use of complementary and alternative therapies in practice including herbal medicines, homoeopathy, acupuncture, acupressure, Bach Flower remedies, aromatherapy and reflexology.
10. **One Month Training in Community Pharmacy and DIC Under the Supervision of Licensed Registered Pharmacist**

Books Recommended

1. Arnold, R. J. G. (Ed.). (2020). *Pharmacoeconomics: From theory to practice* (2nd ed.). CRC Press. https://doi.org/10.1201/9780429491368
2. Beardsley, R. S., Kimberlin, C. L., & Tindall, W. N. (2012). *Communication skills in pharmacy practice: A practical guide for students and practitioners* (6th ed.). Lippincott Williams & Wilkins.
3. Goode, J.-V. ("Kelly"), Roman, L. M., & Weitzel, K. W. (Eds.). (2009). *Community pharmacy practice case studies*. American Pharmacists Association.
4. Lauster, C. D., & Srivastava, S. B. (2013). *Fundamental skills for patient care in pharmacy practice*. Jones & Bartlett Publishers.
5. Peterson, A. M., & Kelly, W. N. (Eds.). (2015). *Leadership and management in pharmacy practice* (2nd ed.). Routledge. https://doi.org/10.1201/b17919
6. Rutter, P. (2025). *Community pharmacy: Symptoms, diagnosis and treatment* (6th ed.). Elsevier.
7. Harding, G., & Taylor, K. M. G. (Eds.). (2016). *Pharmacy practice* (2nd ed.). CRC Press.
8. Thompson, J. E. (2009). *A practical guide to contemporary pharmacy practice* (3rd ed.). Williams & Wilkins.

Pharmacy Practice: Pharmacotherapeutics

PHP-714
Cr. Hrs. 3

Pharmacotherapy of Drugs Used in:

1. CVS Unit (covering IHD, hypertension etc.).
2. Pulmonary Unit (asthma, COPD, pneumonia etc.).
3. Infection Unit (bacterial, fungal and viral infections).
4. Endocrinology Unit (DM, hyper / hypothyroidism etc.).
5. Nephrology Unit (renal failures etc.).
6. Hematology Unit (bleeding disorders, coagulopathies).
7. Manufacturing Bulk and Sterile: Total parenteral nutrition (TPN).

Books Recommended

1. Chisholm-Burns, M. A., Wells, B. G., Schwinghammer, T. L., Malone, P. M., Kolesar, J. M., Rotschafer, J. C., & DiPiro, J. T. (2010). *Pharmacotherapy principles & practice* (2nd ed.). McGraw-Hill.
2. BDiPiro, J. T., Talbert, R. L., Yee, G. C., Matzke, G. R., Wells, B. G., & Posey, L. M. (2014). *Pharmacotherapy: A pathophysiologic approach* (9th ed.). McGraw-Hill Education.
3. Koda-Kimble, M. A., Alldredge, B. K., Corelli, R. L., Ernst, M. E., Guglielmo, B. J., Kradjan, W. A., & Williams, B. R. (2012). *Koda-Kimble and Young's applied therapeutics: The clinical use of drugs* (10th ed.). Lippincott Williams & Wilkins.
4. Lauster, C. D., & Srivastava, S. B. (2013). *Fundamental skills for patient care in pharmacy practice*. Jones & Bartlett Publishers.
5. Lexi-Comp Inc. (2015). Lexi-Comp Online™. Lexi-Comp, Inc.

Important Rules to Remember

1. **Rules Concerning the Promotion and Repetition of Courses**
   The student passing at least 80% courses in an academic year would be promoted to next higher class. There would be no special examination for courses of Pharm. D. first to fifth professional class. Students requiring to pass such a course, shall repeat it along with the regular class. There may be a supplementary examination for the failures of the Pharm. D. fifth Professional. This examination will be held after six weeks of the announcement of the Pharm. D. (Final) results.

2. **Attendance**
   Attendance at in each subject is compulsory for all students and no student shall be eligible to appear at any University examination unless he has attended 75 per cent classes in the course.
   Shortage in attendance up to 5 per cent only may be condoned by the Dean for bonafide reasons. The Vice-Chancellor may condzone a further shortage of 10 per cent in cases of special hardship, but no student whose attendance falls below 60 per cent shall be sent up for any University examination.
   Attendance will be counted from the date classes begin and NOT from the date of admission of a student. Provided that the attendance of a student admitted after rendering National Service will be counted from the date of his admission.
   A student who shows indifference to his studies by continued absence for 3 weeks from the date of his admission shall cease to be a student of the University. Appeal against the cancellation of admission may be made to the Chairman of the Department and the Dean's decision in this behalf shall be final.

3. **Maximum Duration for Completion of Degree**
   Maximum duration for completion of Pharm-D. degree will be seven years. After this period fresh admission at the level of Pharm-D. 1st Year will be required.

Guidelines to Participate in Convocation

These are some notes which provide help you to know the ethics for the participation of Convocation, which will memorable movements in your live:

- Do not forget to bring your Invitation Card with you, because entry will not be allowed without Invitation Card.
- Participating graduates may be accompanied by his/her parent/guardian as specified by them during registration.
- Degree participants should reach the convocation ground on time.
- Wear the special dress, including the gown, hood and the special cap.
- The hood color represents your faculty, and for Pharmacy, the color is gray.
- Before the endorsement of degree, the tassel of the cap is on your right side.
- After the degree is conferred, bow down your head, and change the direction of the tassel to your left this is called turning of tassel indicating that now you are a graduate.
- Leave the ground quickly and at the end of the ceremony after all the degrees are conferred, throw your cap in air to show your happiness and joy.

Group Photo of the Dean Office Staff

Sitting, from L to R: Mr. Muhammad Faizan, Mr. Zahid Ahmed Khan, Mr. Nadeem Ahmed, Mr. Muhammad Faisal Aziz, Mr. Mir Jamali.

Standing, from L to R: Mr. Faizan Khalil, Mr. Waqar Khan.

Group Photo of the Seminar Library Staff

Sitting, from L to R: Mr. Rafiat Wasiullah, Ms. Tasneem Ara Khanum, Mr. Muhammad Nadeem.

Group Photo of the Non-Teaching Staff Department of Pharmaceutics

Sitting, from L to R: Mr. Furqan Aleem, Mr. Muhammad Kabir, Mr. Muhammad Naeem Khan, Mr. Muhammad Shahid, Baloch, Mr. Faheem Ahmed.

Standing, from L to R: Mr. Kamran Khan, Mr. Shafiq Iqbal Khan, Mr. Atif Hussain, Mr. Moon, Mr. Muhammad Danish Khatak, Mr. Sanaullah Khan.

Group Photo of the Non-Teaching Staff Department Pharmaceutical Chemistry

Sitting, from L to R: Mr. Naeem Ahmed, Mr. Muhammad Rashid, Mr. Muhammad Khalid Khan, Mr. Shoaib Khan, Mr. Abdul Waheed.

Standing, from L to R: Mr. Muhammad Hamza Siddiqui, Mr. Manzooruddin, Mr. Amir Khan.

Group Photo of the Non-Teaching Staff Department Pharmacology

Sitting, from L to R: Mr. Fareed Ur Rehman, Mr. Syed Faisal Ul Haq, Mr. Muhammad Ibrahim, Mr. Inayat Ali, Mr. Ghulam Sarwar.

Standing, from L to R: Mr. Muhammad Aamir, Mr. Ajaz Ahmed Qureshi.

Group Photo of the Non-Teaching Staff Department Pharmacognosy

Sitting, from L to R: Mr. Khawja Azhar, Mr. Muhammad Mansoor, Ms. Uzma Parveen, Mr. Muhammad Rehan, Mr. Muhammad Shahab Ali.

Academic Calendar **(Morning Program)**

First Semester 2025

Orientation Day	January 01, 2025
Teaching	January 02 – May 02, 2025
Semester Examinations	May 07– June 02, 2025
Semester Break	June 03 – June 27, 2025

Second Semester 2025

Teaching	June 30 – October 31, 2025
Semester Examinations	November 10 –December 05, 2025
Semester Break	December 06 – December 31, 2025

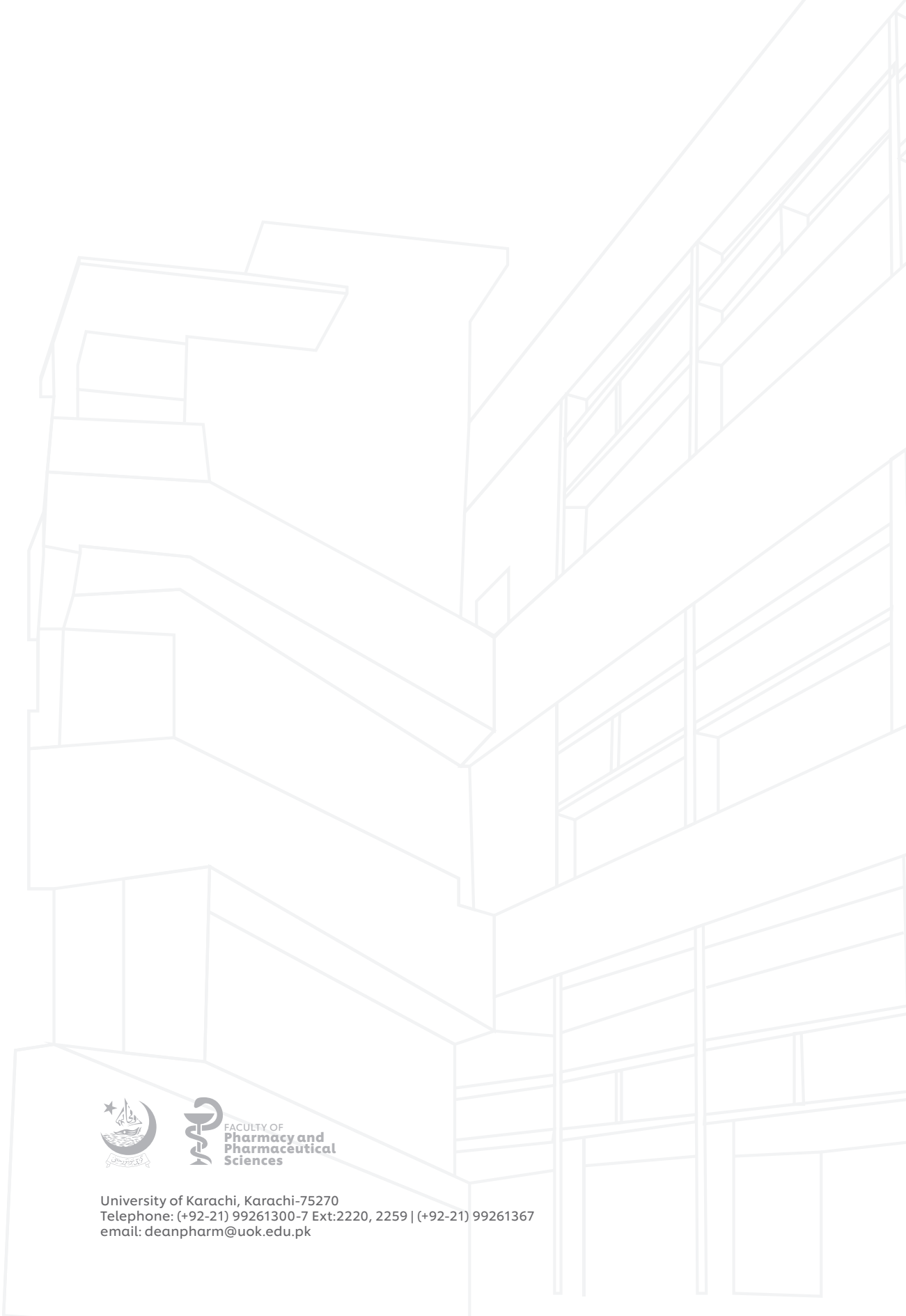
Academic Calendar **(Evening Program)**

First Semester 2025

Orientation Day	February 03, 2025
Teaching	February 04 – June 06, 2025
Ramadan	Online class schedule March 01 – March 30, 2025
Eid ul Fitr Break	March 31 – April 03, 2025
Teaching Resume	April 04– June 06, 2025
Semester Examinations	June 11 – July 04, 2025
Semester Break	July 04 –July 20, 2025

Second Semester 2025

Teaching	July 21 – November 20, 2025
Semester Examinations	Novembe 24 – December 19, 2025
Semester Break	December 20, 2025 Till the commencement of the the First Semester-2026



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