

Graduate Programs in the Department of Pharmaceutical Chemistry

Introduction

The Department of Pharmaceutical Chemistry offers graduate programs leading to degrees in pharmaceutical chemistry at both master and doctoral levels. The programs provide opportunities for qualified pharmacists to carry out research in a wide variety of pharmaceutical subjects under the umbrella of two main research groups: Medicinal Chemistry and Analytical Pharmaceutical Chemistry “Drug Analysis”. In addition, the department of pharmaceutical chemistry, in conjunction with the department of pharmaceutics, offers a joint M.Sc. program on quality control of pharmaceuticals. The programs are directed towards pharmacists employed or seeking employment in health services, pharmaceutical industries, research and development, drug information, drug registration divisions and pharmacists working in teaching and in research institutes. The departmental research laboratories together with the college central laboratory offer specialist facilities in the research subject areas.

Master of Pharmaceutical Sciences (Pharm. Chem.) Degree Program

Program Description

The primary objective of the master program is to develop a highly educated pharmacist who would possess strong knowledge base and skill on drug analysis, the molecular level of drug action, disposition, metabolism, elimination and toxicity as well as drug design and synthesis. The graduate is expected to possess effective interaction with individuals and groups including patients and those in the health and other pharmaceutical institutes.

Program Goals

1. Provide knowledgeable and skillful pharmacists for the various pharmaceutical sectors.
2. Development of the graduate's ability to identify and solve problems pertinent to his profession through knowledge, research and literature consultation.
3. Enrichment of the research programs in the Department.

Program Areas of Study

The program covers two areas of pharmaceutical chemistry:

- a) Medicinal Chemistry
- b) Analytical Pharmaceutical Chemistry

Admission Requirements

1. A Bachelor of Pharmaceutical Sciences from KSU or equivalent.

2. A minimum grade point average (GPA) of 4.0 (on 5.0 scale) or
3. A minimum GPA of 3.75 with a minimum GPA score of 4.0 in the Department's specialized courses.
4. Some candidates may be required to attend and successfully pass selected undergraduate course(s).

Program Requirements

The program of study may be individualized according to the academic background and area of interest of the student and includes: 18 hours of required and 6 hours of elective courses, participation in departmental activities and research involving a topic of interest to the student and to the Department that should be presented in a thesis.

Plan of the Program's Courses

Core Courses

a) First Semester

Course No.	Course Name	Credit Hours
PHC 511	Biopharmaceutical Reaction Mechanisms	3 + 0
PHC 514	Advanced Spectral Analysis of Organic Compounds	2 + 1
PHC 523	Analytical Separation Methods	2 + 1

b) Second Semester

Course No.	Course Name	Credit Hours
PHC 512	Modern Synthetic Reactions	2 + 2
PHC 527	Chemical Kinetics in Drug Analysis	2 + 1
PHC 591	Pharmaceutical Literature	1 + 0
PHC 592	Seminar	1 + 0

Elective Courses

Six credit hours selected for study in the third semester from the courses listed below:

a) Medicinal Chemistry Area

Course No.	Course Name	Credit Hours
PHC 532	Special Topics in Medicinal Chemistry	3 + 0
PHC 533	Drug Design	3 + 0
PHC 534	Toxicological Chemistry	3 + 0
PHC 535	Chemical Aspects of Drug Metabolism	2 + 1
PHC 538	Synthetic Approaches to Complex Bioactive Compounds	3 + 0

b) Analytical Pharmaceutical Chemistry Area

Course No.	Course Name	Credit Hours
PHC 524	Spectroscopic Methods in Drug Analysis	2 + 1
PHC 525	Electrochemical Methods in Drug Analysis	2 + 1
PHC 526	Special Topics in Pharmaceutical Analysis	3 + 0
PHC 528	Environmental Analysis	2 + 1

Master Degree in Pharmaceutical Sciences (Quality Control of Pharmaceuticals) Program

Program Description

Drug and pharmaceutical industries have seen great development in the last decade. In effect, parallel advancement in the ways and methods of quality control of pharmaceuticals became as necessity. This program was designed and constructed to equip the graduate with the most recent procedures of drug analysis and the knowledge of the various factors and parameters encountered in the stability of pharmaceutical compounds.

Program Goals

1. Provide governmental and private health sectors as well as drug industries with personnel suitably qualified in quality control of pharmaceuticals.
2. Provide the graduate with a wide base of knowledge of the chemical, pharmaceutical and microbiological aspects of drug quality control.
3. Meet the increasing demands of pharmacists seeking graduate studies in pharmaceutical quality control.

Admission Requirements

1. Bachelor of pharmaceutical sciences from KSU or equivalent with a minimum of very good GAP.
2. Personal interview.

Program Requirements

The program is set up on required courses comprising 43 credit hours, including a three-hour research project.

Plan of the Program's Courses

a) First Semester

Course No.	Course Name	Credit Hours
PHC 524	Spectroscopic Methods of Drug Analysis	2 + 1
PHC 525	Electrochemical Methods in Drug Analysis	2 + 1
PHT 533	Drug Delivery Systems	3 + 1
PHC 593	Computer Programs in Pharmaceutical Quality Control	2 + 1
PHT 591	Seminar	1 + 0

b) Second Semester

Course No.	Course Name	Credit Hours
PHT 513	Kinetics and Drug Quality	2 + 1
PHC 523	Analytical Separation Methods	2 + 1
PHT 525	Quality Assurance in Pharmaceutical Industry	2 + 1
PHT 581	Pharmaceutical Microbiology–I	2 + 1
PHC 592	Seminar	1 + 0

c) Third Semester

Course No.	Course Name	Credit Hours
PHC 516	Pharmacopeial Methods of Analysis of Drugs and Dosage Forms	2 + 2
PHT 527	Advanced Quality Assurance in Pharmaceutical Industry	3 + 1
PHT 582	Pharmaceutical Microbiology–II	2 + 1

d) Fourth Semester

Course No.	Course Name	Credit Hours
PHT 593	Advanced Topics in Quality Control of Pharmaceuticals	3 + 0
QCP 595	Research Project	0 + 3

Doctor of Philosophy Degree Program

Program Description

The Doctor of Philosophy degree program in Pharmaceutical Sciences educates the students in a broad range of chemically based disciplines so that its graduates are able to apply the vigor and methods of physicochemical sciences and to integrate these with modern analytical, medicinal and biological sciences. Areas of specialization in the program include: Medicinal Chemistry and Analytical Pharmaceutical Chemistry “Drug Analysis”. The objectives of the program include promoting the student’s scholarly accomplishments and developing the students’ teaching skills and ability to conduct independent research.

Program Goals

1. Provide the educational and professional institutes, research centers and pharmaceutical industries with highly specialized personnel.
2. Provide opportunities for the increasing number of the master degree graduates interested in gaining higher qualifications.
3. Enrichment of research in the Department.
4. Provide the graduate with a broad basic knowledge of medicinal chemistry and analytical pharmaceutical chemistry that enables him to advance his skills in independent research and professional problem-solving attitude.

Program Areas of Study

The program covers two areas of pharmaceutical chemistry:

- a) Medicinal Chemistry
- b) Analytical Pharmaceutical Chemistry

Admission Requirements

1. A Bachelor in Pharmaceutical Sciences plus a Master Degree in Pharmaceutical Sciences (Pharm. Chem.) or related Master Degree in Pharmaceutical Sciences.
2. A minimum score of 500 on the TOEFL or equivalent on IELTS.
3. Personal interview.

Program Requirements

The program of study may be individualize according to the academic background and area of research interest of the student and include required course work, participation in departmental activities and in-depth research involving a topic of interest to the student and the Department. The courses required for graduation comprise 19 credit hours. The student is required to pass successfully a comprehensive examination at the end of the two semester courses. The student is also required to demonstrate his ability to conduct original research, compose and defend a thesis.

Plan of the Program's Courses

Level One: Core Courses

Course No.	Course Name	Credit Hours
PHG 541	Pharmacometrics	3 + 0
PHC 660	Physical Pharmaceutical Chemistry	2 + 0
PHC 670	Stereochemical Aspects in Medicinal Chemistry	2 + 0
PHC 671	Structural Elucidation Techniques in Medicinal Chemistry	2 + 0
PHC 680	Seminar in Pharmaceutical Chemistry-1	1 + 0

Level Two: Medicinal Chemistry Area

Course No.	Course Name	Credit Hours
PHC 672	Drug Design and Synthesis	2 + 0
PHC 673	Chemistry of Medicinal Heterocycles	2 + 0
PHC 674	Mechanistic and Catalytic Aspects in Medicinal Chemistry	2 + 0
PHG 542	Pharmacological Screening	0 + 2
PHC 681	Seminar in Pharmaceutical Chemistry-2	1 + 0

Level Two: Analytical Pharmaceutical Chemistry Area

Course No.	Course Name	Credit Hours
PHC 661	Recent Advances in Electrochemical Analysis	1 + 1
PHC 662	Modern Spectrophotometric Analysis	1 + 1
PHC 663	New Trends in Chromatography and Separation Techniques	1 + 1
PHC 664	Automation in Pharmaceutical Analysis	2 + 1
PHC 681	Seminar in Pharmaceutical Chemistry-2	1 + 0

Courses- Description:

MASTER DEGREE COURSES IN THE DEPARTMENT OF

PHARMACEUTICAL CHEMISTRY

Courses- Description

PHC 511: Biopharmaceutical Reactions Mechanisms (3+0)

The course is designed to provide the student with the present state of knowledge with respect to drug mechanism of action. It covers a wide range of enzyme and receptor-based mechanisms of drug action as well as stereochemical treatment of various medicinal agents and their targets. The methodology and the different techniques used in establishing these aspects shall also be covered.

PHC 512: Modern Synthetic Reactions (2+2)

A course designed to discuss some new reactions and mechanism in organic chemistry with special emphasis on reactions related to synthesis of pharmaceutical compounds.

PHC 514: Advanced Spectral Analysis of Organic Compounds (2+1)

The course concerns with the study of the principles and techniques of Nuclear Magnetic Resonance (NMR), Mass Spectroscopy (MS) and Infra Red (IR) and their application in identification and characterization of organic compounds.

The main objective of this course is to assist in developing the ability of the students to interpret spectra and to use the informations in structure elucidation.

PHC 523: Analytical Separation Methods (2+1)

The course is designed to present different types of liquid chromatography with emphasis on High Performance Liquid Chromatography (HPLC) and recent advances in that area. Furthermore application of HPLC in the quantitation of pharmaceutical compounds is highlighted.

PHC 527: Chemical Kinetics in Drug Analysis (2+1)

The course is tailored to introduce chemical kinetics on experimental and theoretical basis. Kinetic parameters involving order of reaction, rate constant, activation energy and related parameters will be presented. In addition, the use of kinetic methods in quantitation will be elaborated and the link between mechanism and reaction kinetic is highlighted.

PHC 591: Pharmaceutical Literature (1+0)

A course designed to familiarize the student with the current pharmaceutical and medical literature and critically evaluate them. The course serves as a convenient guide for obtaining relevant information from the enormous literature in the field.

PHC 592: Seminar (1+0)

In this course the student is required to prepare and orally presents a short review lecture on a selected specialized topic of current interest in the field of pharmaceutical chemistry.

PHC 524: Spectroscopic Methods in Drug Analysis (2+1)

The course deals with application of advanced methods in single- and multi-component spectrophotometric and spectrofluorimetric analysis of pharmaceutical compounds. Chemical derivatization and functional group analysis using colorimetric methods are also discussed.

PHC 525: Electrochemical Methods in Drug Analysis (2+1)

The course covers advanced aspects of chemical equilibria, potentiometry in aqueous and non-aqueous media, polarography and voltammetry and their applications in characterization and quantitation of selected pharmaceutical compounds.

PHC 526: Selected Topics in Drug Analysis (3+0)

Topics of current and/or special interest in the field of pharmaceutical analysis will be presented.

PHC 528: Environmental Analysis (2+1)

Quality-assurance and routine analysis of the environment is of great value in the health-care programme. The presence of many inorganic and organic pollutants in trace scales needs special sensitive and specific semimicro- up to the ultramicroanalytical techniques, especially those which need no preliminary separation. This course will give the chance to highlight some of such techniques in the environmental quality control and routine testing.

PHC 532: Special Topics in Medicinal Chemistry (3+0)

This is a versatile course for providing the student with recent knowledge on relevant specialized topics in medicinal chemistry. The topics are selected and specifically-tailored to meet the needs and interests of the students.

PHC 533: Drug Design (3+0)

This course deals with the principles and frameworks of basic, current and indeed future drug design techniques. The approach should provide the student with

an understanding on new developments as they become elaborated in future and will be of aid to the student whenever there is a need to appreciate the rationales behind the design of drugs.

PHC 534: Toxicological Chemistry (3+0)

The course aims at familiarizing the student to the various aspects to toxicological chemistry. It deals with the chemical nature, reactions and biotransformation of toxic substances with particular emphasis on the mechanisms involved in the induction of toxic effects elicited by a variety of chemicals and drugs.

PHC 535: Chemical Aspects of Drug Metabolism (2+1)

The course focuses on the in-depth studies of the chemical aspects of drug metabolism. The student will be exposed to the mechanistic, stereochemical and methodological aspects in the molecular field of drug metabolism. The laboratory period exposes the student to the different methods and techniques used in the study and evaluation of drug metabolism.

PHC 538: Synthetic Approaches to Complex Bioactive Compounds (3+0)

The course deals with the logic underlying the rationale analysis of complex synthetic problems. The basic concepts of retrosynthetic analysis and the general strategies for generating possible synthetic pathways by systematic reduction of molecular complexity are outlined. These pathways are then applied to integrated multistep syntheses of bioactive target molecules of interest.