**Introduction**

Medicinal chemistry is a field that applies the principles of chemistry and biology and creates knowledge in which therapeutic substances are obtained. Therefore, a graduate of the field of medicinal chemistry must not only be an organic chemist, but also must have basic information in biological sciences. In particular, it has biochemistry, pharmacology and pharmacokinetics. Medicinal plants have always been related to humans throughout history, and their medicinal effects and uses are not hidden from anyone. Medicinal plants have a large market in the world. Therefore, many of these plants must be cultivated in large farms. In creating a field, basic factors must be considered to maintain the quality and amount of its effective substances. Therefore, plant resources are one of the most important sources for the production and introduction of leader compounds in the process of drug development. Medicinal chemistry deals with the development of drugs (Drug Discovery), which requires mastery of sciences such as organic chemistry, biochemistry, and pharmacology. Synthesis of drugs, design of new molecules and molecular modifications in order to optimize drug effects are important issues in this branch of medicinal chemistry. The use of molecular modeling software is very helpful in this regard, which is divided into a branch called Computational Medicinal Chemistry, which graduates of medicinal chemistry can work in this field. This topic is combined with the science of Drug Design. On the other hand, an important branch of medicinal chemistry is the analysis of medicinal and chemical substances, which can be very important in determining the molecular structure of chemical and medicinal substances by using devices for determining the chemical structure such as UV JR Mass MR and also by using their advanced techniques. The subject is very useful in the emergence of new compounds of natural origin by the other way , an graduate of medicinal chemistry using quantitative analysis methods such as chromatography and their advanced types as well as other quantitative devices such as polarography AA polarimetry and... in the quantitative control of medicinal substances and determining the amount of chemical and medicinal substances in different chemical matrices and Biological can be very decisive. In fact, the important branch of analysis in medicinal chemistry establishes a very close relationship with industries, which is very useful in the qualitative and quantitative control of drugs. The development of new analysis methods to determine the amount of substances. for various purposes, such as pharmacokinetic studies, doping, quantitative and qualitative control of drugs, and stability studies. It is one of the capabilities of a student of medicinal chemistry, since the master's course in the field of medicinal chemistry will create an effective step in the direction of the training of drug synthesis specialists, and it will help activate the pharmaceutical industry and provide the basis for economic growth. To be inside the country, according to the above content and after obtaining the opinion of the experts in this field, the present program has been compiled and made available to the universities of medical sciences of the country. The editing committee welcomes the valuable opinions of respected experts in this field in revising this program.

**Name and definition of the field and degree**

Master's Degree in Pharmaceutical Chemistry (M.Sc.) The Ph.D.

 in Pharmaceutical Chemistry at the Master's degree is an unprecedented branch of pharmaceutical sciences in which the chemistry and biology of therapeutic substances is achieved by reinforcing the principles and foundations. Students of this discipline are acquainted with the principles of bioscience such as pharmaceutical biochemistry, pharmacokinetics, drug discovery technology, the properties of medicinal plants and methods of small and qualitative control of drugs and play an important role in the creation of new medicinal compounds.

**History of the field in the world and Iran**

Since 1997, the Faculty of Pharmacy of Tehran University of Medical Sciences has organized a Ph.D. course in medicinal chemistry, and in the following years, it was also launched in Isfahan, Shiraz, Shahid Beheshti, Tabriz, and Mazandaran universities. Currently, this field is recruiting students in USM University of Malaysia.

**Considered Values**

The values ​​that are emphasized in this course are: - Emphasis on health-oriented by producing drugs with more effective effect and minimal side effects for body parts, emphasis on national resources (abundant potential of planting and harvesting medicinal plants, coordination with modern science and utilization From the scientific and cultural treasures of Iran in the field of native medicinal plants, emphasis is placed on increasing the quality of life by reducing the adverse effects of drugs

Emphasis on self-reliance in the field of self-sufficiency in drug production

Emphasis on optimization of drug use in the country, emphasis on compliance with professional ethics, especially in RCT research and compliance with ethical principles in different stages

Production to consumption of drugs

**Mission**

The mission of this field is to train knowledgeable, skilled, capable and experienced manpower for drug factories, food and drug control laboratories, relevant institutions and universities.

**Vision of the educational program**

With the launch of this course, it is hoped that in the next 10 years, there will be a continuous master's course in medicinal chemistry by using the latest standards and scientific achievements and new techniques in the preparation and manufacture of new And specific drugs and how their job can play a significant role in the preparation and control of drug consumption in society and take an effective step towards self-sufficiency in production and performance and optimizing drug consumption in the country.

**Aims**
Training and provision of human resources for the country’s pharmaceutical industries, regarding the synthesis and analysis of pharmaceutical substances.
providing experts needed for educational and research departments in educational centers and the food and drug control departments of the country.

**Role Definition**
The roles of graduates in this field are:
1.Service
2.Research
3.Consulting
4.Educational

**task analysis**
Service field
providing services in food and drug quality control laboratories and pharmaceutical and chemical factories.
Research field
presenting research projects from different fields, preparation and design of medicines, determining the mechanism, function, and effect of Nano-drugs, and like that.
supervision of research projects in related fields
Do scientific and industrial research in related centers.
Consulting field
Providing consulting services to applicants
Educational field
Providing training courses, empowerment workshops, and related centers
cooperation in the development of instructions related to the field or health authorities

**General educational strategies**

The following strategies are used in the implementation of this program:

A Combination of student and professor

Strategy based on professional duties

Paying attention to the needs of the community at local, regional and national levels

Paying attention to the problem

Strategy based on laboratory

Prediction of optional lessons in the problem

**Conditions and methods of student admission**

Passing the entrance exam according to the rules and regulations of ministry of health, treatment and medical education

Holders of bachelor’s degree in pharmacy, pure chemistry, applied chemistry, chemistry secretary, biochemistry, Medical laboratory sciences

The test materials and their coefficients are as follow:

|  |  |
| --- | --- |
| Coefficients | Test Materials |
| 2 | Organic Chemistry |
| 2 | Analytical Chemistry |
| 2 | Biology |
| 2 | Biochemistry |
| 2 | General English Language |
| 10 | Total |

\*In order to get information about the latest changes in accepted academic documents and exam coefficients for each academic year, please refer to the non-consecutive master’s exam booklet of medical sciences related to that academic year.

**Similar courses**

in the country, an independent course under this title in the non-continuous master's degree has not been established so far.

 **Similar courses abroad**

 in some countries, such as Turkey and Punjab City University and...

The conditions required to start the course are according to the rules of the Development Council of Medical Sciences Universities

**Other cases**

No more.

**Course specification of the educational program of the master's course in the field of pharmaceutical chemistry**

1) Name and definition of the field and related section:

Pharmaceutical chemistry (M.Sc.)

2) Length of period and structure:

In accordance with the educational regulations of the postgraduate course of discontinuous approved by the Supreme Council of Medical Sciences Planning

3) Total number of courses:

The number of courses in this course is 32 units, which are as follows:

\*Compulsory Dedicated Units:21 units

\*Optional Dedicated Units: 5 units

\*Thesis: 6 units

Note: The student is required to pass all or a number of deficient or compensatory courses in addition to passing the courses with the recognition of the department and the approval of the Graduate Council of the University

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Course code | Course name | Number of courses  | Number of Lesson Hours  | Prerequisite |
| Total | Practical | Theoretical | Internship | Total | Practical | Theoretical | Internship |
| 01 | Biology | 2 | \_  | 2  | \_  | 34 | \_  | 34  | \_ | \_ |
| 02 | Statistics and Pharmaceutical Information Systems | 2 | 1  |  1  | \_  | 51 | 34  | 17  | \_ | \_ |
| 03 | Physiology | 3 | \_  | 3  | \_  | 51 | \_  | 51  | \_ | \_ |
| 04 | Biochemistry | 3 | \_  | 3  | \_  | 51 | \_  | 51  | \_ | \_ |
| 05 | Medical Information Systems\* | 1 | .05  | .05  | \_  | 26 | 17  | 9  | \_ | \_ |
| Total  |  11  |

table A): Deficient or compensatory courses of the postgraduate course of Medicinal Chemistry:

 \* Passing this course is mandatory as a deficient or compensatory course for all students.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lesson code | Name of Course | number of courses | Number of Lesson Hours  | Prerequisite or simultaneous |
| Total | Practical | Theoretical | Internship | Total | Practical | Theoretical | Internship |
| 05 | Basics of synthesis | 3 |  1  | 2  | \_  | 68  | 34  | 34  | \_\_\_\_\_\_ | \_\_\_\_\_\_\_ |
| 06 | Pharmacology | 3 | \_  | 3  | \_  | 51  | \_  |  51  | \_\_\_\_\_\_ | 03&04 |
| 07 | Medicinal chemistry 1 | 2 |  \_  | 2  | \_  | 34  | \_  | 34  | \_\_\_\_\_\_ | 06 |
| 08 | Medicinal chemistry 2 | 2 | \_  | 2  | \_  | 34  | \_  | 34  | \_\_\_\_\_\_ | 07 |
| 09 | Instrumental chemistry | 4 | 1  | 3  | \_  | 85  | 34  | 51  | \_\_\_\_\_\_ | \_\_\_\_\_\_ |
| 10 | Heterocyclic Chemistry | 3 | \_  | 3  | \_  | 51  | \_  | 51  | \_\_\_\_\_\_\_ | \_\_\_\_\_\_ |
| 11 | Computational chemistry of drug design | 3 | \_  | 3  | \_  | 51  | \_  | 51  | \_\_\_\_\_\_ | \_\_\_\_\_\_ |
| 12 | Seminar | 1 | \_  | 1  | \_  | 17 | \_  | 17  | \_\_\_\_\_\_ | \_\_\_\_\_\_\_ |
| 13 | Thesis | 6  |
|  Total  | 27  |

 Table B) Dedicated lessons Educational program of the non-continuous master's course in the field of medicinal chemistry

*Table C) Table of special-optional courses Educational program of the non-continuous master's course in the field of medicinal chemistry*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lesson code | Name of Course | number of courses | Number of Lesson Hours  | Prerequisite or simultaneous |
| Total | Practical | Theoretical | Intern ship | Total | Practical | Theoretical | Internship |  |
| 14 | Chemistry of natural compounds | 2 | \_\_\_\_\_\_ | 2  | \_\_\_\_\_ | 34 | \_\_\_\_ | 34 | \_\_\_\_\_ | \_\_\_\_\_ |
| 15 | Medicinal chemistry and nanotechnology | 3 | \_\_\_\_\_ | 3  | \_\_\_\_\_ | 51 | \_\_\_\_ | 51 | \_\_\_\_\_ | \_\_\_\_\_\_ |
| 16 | Biological tests | 3 | 1  | 3  | \_\_\_\_\_ | 68 | 34 | 34 | \_\_\_\_\_ | \_\_\_\_\_\_ |
| 17 | Radio pharmacy | 2 | \_\_\_\_\_ | 2  | \_\_\_\_\_ | 34 | \_\_\_\_ | 34 | \_\_\_\_\_ | \_\_\_\_\_\_ |
| 18 | Basics of biotechnology | 2 | \_\_\_\_\_ | 2  | \_\_\_\_\_ | 34 | \_\_\_\_\_ | 34 | \_\_\_\_\_ | \_\_\_\_\_\_ |
|  Total  |  12  |

The student must complete 5 units of the above courses according to the topic of the thesis, with the approval of the supervisor and the approval of the graduate education council of the university.