Pharmacognosy is an important discipline in the Pharmacy curriculum in Iran. The branch is focusing on natural products research, traditional medicine, ethnobotany and phytochemistry from plant, marine and other life origins on both analytical and preparative scale. Department of Pharmacognosy is located in the Faculty of Pharmacy, an integral part of the Tabriz University of Medical Sciences. Department of Pharmacognosy is committed to provide outstanding training in the natural sciences through accredited programs and to conduct quality research at international level. Our Department is equipped with efficient devices and instruments, offering scientific research opportunities at the research labs under the supervision of experienced subject specialists and competent academic staff. Our Mission is to train competent high-skilled pharmacists and scientists equipped with the knowledge, skills and values required to perform scientific research at the highest levels by integrating multidisciplinary approaches. We aim to be the implementer and pioneer in conducting research of which results will contribute in science and improve the quality of life standards of our society as well as humanity.

**Ph.D Courses**

**Advanced Plant Biochemistry**

**Objective:** Understanding the primary metabolite production systems in plants

**Contents**
- Plant cell and its molecular content
- Major metabolic pathways and biochemical mechanisms in plants
- Metabolism of carbohydrates
- Metabolism of lipids
- Primary metabolism of nitrogen
- Nucleic acids and proteins
- Interpretation of gene regulation in plants
- Chemical Plant Pathology
- Chemical Plant Ecology

**Plant communities and ecological issues in Iran**

**Objective:** Identification of the plant community’s ecology in Iran

**Contents**
- Definition of phytogeography
- References of Iranian flora
- Iranian plants growth regions and areas
- Definition of ecology and its subdivisions
- Ecological factors
- Species compromise
- Ecological breeds
- Chemical breeds
- Factors affecting plant communities
- Biological plant types
- Economic and marketing of raw materials and natural medicines

**Economic and marketing of natural raw materials and phytomedicines**

**Objective:** Identification of issues and economic factors influencing the marketing of crude plants materials and phytomedicines

**Contents**
- Course introduction
- Marketing information on herbal and natural medicines
- Efficiency
- Evaluating the needs and market size
- Increase in demand and demographic health care
- Effective marketing
- Distribution
- Industrial calculation of the total price for the product
- Introduction of the widely consumed medicinal plants
- Quality management and assurance of the future market

**Medical information systems**

**Objective**
- Introduction to statistical softwares
- Recognition of pharmacognosy databases

**Contents**
- Theory
  - Introduction to Excel
  - Introduction to SPSS
  - Introduction to ethnobotany and phytochemistry database
  - Introduction to Medline, Scopus and etc
- Practical
  - Practicing with Excel
  - Practicing with SPSS
  - Practicing with ethnobotany and phytochemistry database
  - Practicing with Medline, Scopus and etc

**Advanced Organic Chemistry**

**Objective:** Learning Advanced Organic Chemistry as a base course and recognizing different chemical groups of natural
Objective: Ability to identify and determine the molecular structure of natural compounds

Contents
- Theory
  - NMR Spectroscopy (1)
  - Dimensional NMR (2)
  - DEPT (3)
  - New Techniques in advanced methods of instrumental analysis (4)
  - Mass Spectroscopy (5)

Practical
- Obtaining NMR spectra and their interpretation (1)
- Obtaining dimensional NMR spectra and their interpretation (2)
- Implementation of new techniques of instrumental analysis and their interpretation (3)

**Extraction, isolation and identification of natural products**

Objective: Acquiring ability and skills to perform all forms of extraction, isolation and identification of natural products

Contents
- Theory
  - Introduction to sample preparation and extraction (1)
  - Introduction to the preliminary separation (2)
  - Introduction to chromatographic separation methods (3)
  - Introduction to other separation methods (4)
  - Introduction of specific methods for extraction, separation, and identification of phenolic and terpenoid compounds (5)
  - Introduction of specific methods for the extraction, separation and identification of organic acids, lipids, and other related compounds (6)

Practical
- Performing separation, extraction and identification of anthraquinone glycosides (1)
- Performing separation, extraction and identification of flavonoid glycosides (2)
- Performing separation, extraction and identification of steroid glycosides (3)
- Performing separation, extraction and identification of lactone glycosides (4)
- Performing separation, extraction and identification of cyanogenic glycosides (5)
- Performing separation, extraction and identification of compounds containing sulfur (6)
- Performing separation, extraction and identification of monoterpenes (7)
- Performing separation, extraction and identification of diterpenes (8)
- Performing separation, extraction and identification of sesquiterpenes (9)
- Performing separation, extraction and identification of triterpenoids and terpenoid lactones (10)
- Performing separation, extraction and identification of tropane alkaloids (11)
- Performing separation, extraction and identification of isoquinoline alkaloids (12)
- Performing separation, extraction and identification of indole alkaloids (13)
- Performing separation, extraction and identification of pyridine and piperidine alkaloids (14)
- Performing separation, extraction and identification of pyrrolizidine alkaloids (15)
- Performing separation, extraction and identification of purine alkaloids (16)

**Advanced phytochemistry**

Objective: Identifying and assessing the biosynthetic pathways of biomaterials

Understanding the chemical structure of the compounds generated in the secondary biosynthetic pathways

Contents
- Theory
  - Introduction of the biosynthetic pathways of different types of plant compounds (1)
  - Limitations and benefits of labeling methods and the use of labeling to identify pathways for biosynthesis of plants (2)
  - Identification of the biosynthetic pathways and introducing the chemical structure of carbohydrates and lipids (3)
  - Identification of the biosynthetic pathways and introducing the chemical structure of simple phenols (4)
  - Identification of the biosynthetic pathways and introducing the chemical structure of phenylpropanoids (5)
  - Identification of the biosynthetic pathways and introducing the chemical structure of flavonoids (6)

- Identification of the biosynthetic pathways and introducing the chemical structure of terpenoids (7)
- Identification of the biosynthetic pathways and introducing the chemical structure of terpenoids (8)
- Identification of the biosynthetic pathways and introducing the chemical structure of quinones (9)
- Identification of the biosynthetic pathways and introducing the chemical structure of alkaloids (10)
- Identification of the biosynthetic pathways and introducing the chemical structure of cyanogenic glycosides (11)

**Industrial processing of Medicinal Plants**

Objective: Familiarity with devices and industrial process for the preparation and storage of the plant material used in the herbal preparations

Contents
- Theory
  - Introducing relevant devices (1)
Environmental factors affecting plant compounds

Collection
Drying
Grinding
Standardization
Storage
Industrial extraction and storage
Drying the extract
Essential oil extraction
Materials used in packaging
Packaging methods
Preparing Package ID

Control of natural products

Objective
Understanding different methods for Control of natural products
Industrial processing of Medicinal Plants
Ability to perform Control of natural products

Contents

Theory
Control of different plant species
Quality Control
Excellence measurements
Bacterial and fungal control
Insect repellent control
Control of radioactive materials
Control of heavy metals
Quantity control

Practical
Performing control of different plant species
Performing quality control
Performing excellence measurements
Performing bacterial and fungal control
Performing insect repellent control
Performing control of radioactive materials
Performing control of heavy metals
Performing quantity control
Quantitative determination of a group of compounds
Determining the amount of remaining extract after drying
Control of toxic compounds
Stability of the medicinal plants preparations

Phytotherapy and medicinal plants informations

Objective: Understanding the application of medicinal plants in the treatment of diseases

Contents

Phytotherapy foundations
Phytopharmacology
Phytopharmacokinetics and phytopharmacodynamics
Herbal medicines interactions
Herbal medicines side effects
Effective herbal medicines for pain and inflammation
Effective herbal medicines for gastrointestinal system
Effective herbal medicines for cardiovascular
Effective herbal medicines for tumors
Effective herbal medicines for skin
Effective herbal medicines for immune system
Effective herbal medicines for kidneys and urinary tract
Effective herbal medicines for liver and bile
Effective herbal medicines for central nervous system
Effective herbal medicines for respiratory system
Effective herbal medicines for microbes and parasites

Iranian Traditional Medicine

Objective: Familiarity with Iranian Traditional Medicine

Contents

History
Foundations
Terms and expressions in traditional medicine
Fames and sources for traditional medicine
Introduction of complementary medicine
Introduction of dosage forms used in traditional medicine
Featured topics in pharmacognosy

Objective: Understanding other important issues of the day in pharmacognosy

Contents
- Colored compounds from natural resources (1)
- Herbal additives (2)
- Different products (derivatives of cellulose, agar, gelatin, etc) (3)
- Pesticides from natural resources (4)
- Medicinal plants and health cosmetics (5)
- Poisonous plants (6)
- Antitumors from natural resources (7)
- Antioxidants from natural resources (8)

Plant cell and tissue culture

Objective: Introduction to plant cell and tissue culture techniques for the production of plant metabolites

Ability in performing plant cell and tissue culture techniques for the production of plant metabolites

Contents

: Theory
- Course introduction (1)
- History of plant tissue culture (2)
- Plant tissue culture laboratory (3)
- Aseptic techniques (4)
- Nutrient content and other materials used in plant tissue culture media (5)
- Production and maintenance of callus (6)
- Suspension cell cultures (7)
- Production of secondary metabolites and biochemical transformations (8)
- Methods of increasing the production of herbal metabolites (9)
- Bioreactors (10)
- Drugs produced by cell culture techniques (11)

: Practical
- MS medium preparation and sterilization (1)
- Preparation of Callus from carrot root cambium (2)
- Preparation of carrot suspension cell culture (3)
- Evaluation of secondary metabolite production by carrot cell cultures (4)
- Evaluation of biochemical transformations by suspension cell cultures (5)

Fermentation and genetic engineering

Objective: Learning about the fermentation and genetic engineering methods products

Contents

- Foundations of genetic engineering and cloning (1)
- Pharmacobiotechnology (2)
- Bioreactors (3)
- Proteins and peptides (4)
- Antibiotics (5)
- Biological compounds and modulators of the immune system (6)
- Fermentation and pharmaceutical changes by microorganisms (7)
- Industrial biotechnology (8)

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