

Pharmacognosy

Course Title	Pharmacognosy
Course Code	Phar2082
Course Credit	4
Year and Semester	Year II, Semester II
Course Category	Major course
Pre-requisite	Chemistry of Natural Products
Co-requisite	---
Enrollment	Regular
Program	Undergraduate

Course Rationale:

The course familiarizes trainees with the basic scientific knowledge and skill needed to obtain and characterize active substances from natural sources. It also helps trainees to understand and realize the fact that nature provides the origin and continuous supply of drugs or drug substances, and think about the proper management and utilization of such natural products.

Course Description:

The course is designed in such a way that the trainee gets well acquainted with the study of the physical, chemical, biochemical and biological properties of drugs, drug substances, or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources.

Course Objectives:

By the end of this course the trainee is expected to be familiar with the general aspects of crude drugs, extraction and isolation methods and the distribution, properties and uses of various primary and secondary metabolites of plant, animal and mineral origin. The student will be able to extract, identify and evaluate compounds from natural sources. The student will also give services related to extraction, isolation and evaluation of natural products in addition to advising the patient about drug-herb interactions.

Course Plan/ Contents:

1. General Introduction (7 hrs)

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| 1.1. Definition, History and scope of Pharmacognosy | (1 hr) |
| 1.2. Crude drugs: | (5 hrs) |
| • Definition and Nomenclature of crude drugs | |
| • Classification of crude drugs | |
| • Types of preparations from plants | |
| • Evaluation of crude drugs | |
| • Factors affecting crude drug quality | |
| • Official and Unofficial drugs | |
| 1.3. Steps in the scientific analysis of drugs from natural resources | (1 hr) |
| • Selection of plant material | |
| • Taxonomic identification of the plant | |
| • Literature survey on the identified plant | |
| • Design of appropriate extraction and separation methods | |
| • Checking extracts/ fractions for pharmacological activity | |
| • Identification of classes of compounds found in the plant (phytochemical screening) | |

- Official and Unofficial drugs
- 1.3. Steps in the scientific analysis of drugs from natural resources (1 hr)
- Selection of plant material
 - Taxonomic identification of the plant
 - Literature survey on the identified plant
 - Design of appropriate extraction and separation methods
 - Checking extracts/ fractions for pharmacological activity
 - Identification of classes of compounds found in the plant (phytochemical screening)
 - Isolation of active compounds or fractions responsible for the pharmacological activity of the plant
2. **General methods in studying constituents of crude drugs (8 hrs)**
- 1.1 **Crude drug constituents (Primary and secondary) (1hr)**
- 1.2 **Extraction (3 hrs)**
- Definition and the need for extraction
 - Preparation of plant material for solvent extraction
 - Choice of suitable solvents
 - Methods of extraction
- 1.3 **Isolation and purification of active constituents (4hrs)**
- Classical methods of separation (precipitation, crystallization...)
 - Modern methods/chromatographic methods
3. **Major plant constituents and their botanical sources (30)**
- 2.1 **Carbohydrates (2 hrs)**
- Sugars and sugar containing drugs
 - Compounds related to sugars
 - Polysaccharides
 - Gums and mucillages
- 2.2 **Glycosides (6 hrs)**
- General properties of glycosides
 - Classification of glycosides
 - Classes of glycosides: Anthraquinones, Saponins, Cardiac glycosides, Simple phenolic glycosides, Flavonoid glycosides, Isothiocyanate glycosides, Cyanogenetic glycosides, Coumarin glycosides
- 2.3 **Tannins (2 hrs)**
- General properties and Chemistry
 - Classification: Hydrolysable, Nonhydrolysable (condensed), Pseudotannins
 - Significance of tannins
- 2.4 **Lipids and waxes (2 hrs)**
- Lipids: Physical and chemical properties, Extraction methods
 - Official fixed oils/fats and their composition
 - Arachis oil, castor oil, almond oil, sesame oil, theobroma oil, cod liver oil etc
 - Waxes: Definition and general properties, Animal waxes, Vegetable waxes
- 2.5 **Volatile oils (5 hrs)**
- Distribution and occurrence, Uses, Methods of preparation (Distillation, Expression, Extraction with solvent, enzymatic hydrolysis), Physical properties, Chemistry, Biosynthesis
 - Constituents of volatile oils: Hydrocarbons, Alcohols, Aldehydes, Ketones, Esters, Phenols and phenolic ethers Oxides Peroxides Sulfur containing compounds Nitrogen containing compounds
- 2.6 **Resins and Resin Combinations (3 hrs)**
- General properties and chemistry
 - Examples of drugs containing resins: Rosin, Podophyllin, Jalap, Mastic, Cannabis (Preparation, Constituents, Factors affecting the narcotic activity, Legal aspects, Analysis), Oleoresins Oleo-gum resins, Balsams
- 2.7 **Alkaloids (8 hrs)**
- 2.7.1 Definition, Nomenclature, Occurrence, Physical and chemical properties, Detection, Extraction and isolation
- 2.7.2 Classification
- 2.7.3 Classes of alkaloids
- Ornithine derived alkaloids: Tropane alkaloids Solanaceae alkaloids, Coca alkaloids, Pyrolizidine alkaloids
 - Lysine derived alkaloids: Lobelia alkaloids, Lupine alkaloids
 - Nicotinic acid derived alkaloids: Ricinine, Areca alkaloids, Tobacco alkaloids
 - Tyrosine derived alkaloids: (1) Simple phenylethylamines and tetrahydroisoquinolines;

2.7.1 Definition, Nomenclature, Occurrence, Physical and chemical properties,

Detection, Extraction and isolation

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- Lysine derived alkaloids: Lobelia alkaloids, Lupine alkaloids
- Nicotinic acid derived alkaloids: Ricinine, Areca alkaloids, Tobacco alkaloids
- Tyrosine derived alkaloids: (1) Simple phenylethylamines and tetrahydroisoquinolines: Mescaline, Ephedrine, Alkaloids of 'Khat'; (2) Colchicine; (3) Papaver alkaloids: Phenanthrene group, Benzyloquinoline group; (4) Emetine and related alkaloids; (5) Tubocurarine
- Tryptophan derived alkaloids: Simple indoles, Tricyclic alkaloids: Pergamum alkaloids, Physostigma alkaloids, Ergot alkaloids (Historical background, Life cycle of ergot, Commercial production, Chemistry and occurrence, Biosynthesis and use, LSD), Rauwolfia alkaloids, Strychnos alkaloids, Cinchona alkaloids, Periwinkle alkaloids
- Histidine derived alkaloids: Pilocarpine
- Polyacetate derived alkaloids: Hemlock alkaloids
- Pseudoalkaloids: Steroidal alkaloids: Veratrum alkaloids, Solanum alkaloids, Holarrhena alkaloids, Buxus alkaloids, Purine alkaloids

4. Selected topics (2 hrs)

- Cytotoxic and carcinogenic compounds of plant origin
- Other important topics

Mode of Delivery	<ul style="list-style-type: none">• Illustrated Lectures• Practical sessions• Seminars and assignments
Mode of Evaluation	<ul style="list-style-type: none">• Seminars/assignments/quiz 15%• Mid semester exam 25%• Lab exam 10%• Comprehensive final exam 50%
Text book	• Trease, G.E. and Evans, W.C. Pharmacognosy, 15 th ed. Bailliere Tindall, London, 2002.
References	<ul style="list-style-type: none">• Tyler, V.E., Brady, L.R. and Robbers, J.E. Pharmacognosy, 8th ed. Lea & Febiger, Philadelphia, 1981.• Shah, B.N., Seth, A.K., 2010, <i>Textbook of pharmacognosy and phytochemistry</i>. Elsevier, India.• Brunetone, J. Pharmacognosy, phytochemistry Medicinal plants, 2nd ed. Lavoisier publishing, Paris, 1999.• Pulok K. Mukherejee. Quality control of herbal drugs; an approach to evaluation of botanicals. Business Horizons pharmaceutical publishers. 2002• Internet based materials.