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## MASTER OF SCIENCE IN HERBAL MEDICINE (FULL TIME)

## About the Programme

The Master of Science Program in Herbal Medicine provides students with multidisciplinary training in herbal medicine. The MSc. programme addresses the cutting-edge quality assurance and control of herbal products issues and prepares students for several careers in regulatory agency, academia, research, technical positions in quality control related fields. Herbal therapy predominates in traditional medicine and the interest on herbal medicines and their utilization is increasing day by day. However, a recurring complaint has been a lack of quality studies on herbal medicines. It is therefore important to train students for career in the field of herbal medicine as improvements in analysis and quality control, along with advances in clinical research show the value of herbal medicine in the treatment and prevention of diseases. This will advance the integration of herbal medicines into health care system and enhance quality delivery.

The Objectives are to:

1. Build capacity towards the formulation and development of standardized herbal medicines

2. Bridge the gap and facilitate the integration of herbal medicine into the modern health care system

3. Integrate teaching and research methodologies with traditional knowledge for improved health care.

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The programme will provide opportunity for students in the region to interact, learn and develop skills for herbal medicine integration into the health care delivery system. The programme will also promote and develop regional capacity for standardization, production and administration of herbal medicines.

After the completion of the program, the students will be able to:

* Carry out independent investigations on medicinal plants and natural products
* Have advanced knowledge of phytochemicals and their applications.
* Develop skills in the use of natural products as starting materials for medicines.
* Identify key requirements for identifying and sourcing high-quality, therapeutic-grade plants
* Prepare safe and standardized herbal products from their natural sources.
* Understand the quality control procedures for Herbal medicines.
* Evaluate and analyze traditional knowledge, bridge the information gap of evidence-based data to make rational decisions in developing safe and effective herbal products and formulas.
* Determine safety concerns of herb-herb and herb-drug interactions for herbal products

### **Admission Requirements**

Candidates for M.Sc. in Herbal Medicine must have credit passes in English, Mathematics, Physics, Chemistry and Biology in ‘O’ level or its equivalent at one sitting and hold a Bachelor degree in any of the following disciplines: Pharmacy, Nursing, Plant science, Herbal medicine, Chemistry, Biochemistry, Biology, Nutrition and Botany from any approved University. The minimum entry requirement shall be a second-class lower division honors degree. All candidates shall be subjected to a selection process involving writing and an oral interview.

### **Graduation Requirements**

To obtain an M.Sc. in Herbal Medicine, a candidate must satisfy a minimum of **24 units** of courses in minimum of two (2) semesters and with cumulative grade point average (CGPA) of 2.40 at 800 level made up as follows:

1. 14 units of compulsory theory courses
2. 2 units of Research seminar
3. 4 units of Research project
4. 4 units of elective courses

The duration of the programme shall be minimum of two (2) semesters and maximum of four (4) semesters.

### **List of Courses and No of Units by Levels in tabular form**

**FIRST SEMESTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Status** | **Units** |
| HMS 811 | Standardization of Herbal Medicines | Compulsory | 2 |
| HMS 812 | Techniques in Herbal medicine | Compulsory | 1 |
| PUH 801 | Medical Statistics | Compulsory | 2 |
| PCH 801 | Drug Quality Assurance and  Total Quality Management | Compulsory | 2 |
| BTN 805 | The practice of Taxonomy | Compulsory | 2 |
| PCG 802 | Pharmaceutical analysis of natural drug products | Compulsory | 2 |
| PCT 853 | Formulation of Dosage Forms | Compulsory | 2 |
| PCG 803 | Advanced Phytochemistry | Elective | 3 |
| HMS 813 | Traditional Medicine Systems | Elective | 1 |
| **Total number of units** | | **Compulsory** | **13** |
|  | | **Elective** | **4** |

**SECOND SEMESTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Status** | **Units** |
| PCT 862 | Laboratory Course in Pharmaceutical Technology | Compulsory | 1 |
| HMS 828 | Research Seminar | Compulsory | 2 |
| HMS 829 | Research Project | Compulsory | 4 |
| HMS 821 | Anatomy and Pathophysiology of human system | Elective | 2 |
| PHA 805 | Toxicology | Elective | 3 |
| RSC 821 | Regulation of Pharmaceutical, Biologic Products and Medical Devices | Elective | 2 |
| HMS 822 | Entrepreneurship in Herbal Medicine | Elective | 2 |
| PCG 806 | Cultivation, Conservation and Biodiversity of Medicinal Plants | Elective | 2 |
| **Total number of units** | | **Compulsory** | **7** |
|  | | **Elective** | **11** |

### **Summary of number of units compulsory and elective courses to be taken/available at each Level**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **First Semester** | | **Second Semester** | | **Total** | |
| Level | Units of Compulsory Courses | Units of Elective Courses Available | Units of Compulsory Courses | Units of Elective Courses Available | Total of Compulsory Courses | Total of Elective Courses Available |
| **800** | **13** | **4** | **7** | **11** | **20** | **15** |

### **Course Contents/Description**

**HMS 811: Standardization of Herbal Medicines**

Evaluation and standardization of crude drugs: Physical and Chemical analysis

Evaluation and standardization of crude drugs: (Biological methods of assay:

1. Pharmacological
2. Microbiological
3. Radioimmunoassay

Determination of tannins, Ash value, Extractable matter and Pesticide residues. Proximate analysis.

**HMS 812: Techniques in Herbal medicine**

Laboratory Course: Field trip. Preparation of herbarium specimens, use of flora keys for plant identification, advanced histological techniques, Pharmacognostic drawings, and microscopy as applied to drug evaluation.

**HMS 813: Traditional Medicine Systems**

Traditional herbal medicines; Underlying concepts of medical herbalism, History and usage of herbal medicine; Traditional methods of diagnoses and scientific evidence in support of the use of herbs. Common (global) elements in the therapeutics of herbal traditions around the world. Definitions in traditional medicines, doctrines and practice. Advantages/Disadvantages of traditional medicine.

**HMS 821: Anatomy and Pathophysiology of Human System**

Introduction to human anatomy, cell structures. Anatomical structures of different organs, tissues and muscles e.g. Heart, Liver, Eyes, Reproductive/Endocrine, Respiratory, Joints/connective tissue and muscles that will lead to a good understanding of the actions of natural medicine Pathophysiology and Pathogenesis of diseases will be stressed.

**HMS 822: Entrepreneurship in Herbal Medicine**

Guidelines and regulatory policies on buying and selling of raw materials and finished natural/herbal products. Drug registration processes for herbal drugs/products. Marketing techniques and advertising practices of herbal/natural products. Supply management and distribution chain. Sales management and business planning process. Effective communications skills. Documentation and bookkeeping. Exportation and importation of Negotiation skills

**HMS 828: Research Seminar**

Presentation of seminars on current topics in Herbal Medicines. The objective is to train graduate students how to search for, write-up and orally present scientific information

**HMS 829: Research Project**

Students will be expected to pick research topics on techniques and development of research methodologies for solving problems in any aspect of herbal medicine.

**PUH 801: Medical Statistics**

Design, conduct and interpretation of clinical and epidemiological studies, standard statistical concepts of data descriptions, hypothesis testing including test statistics, correlation, p-values, significance levels, confidence levels and linear regression.

**PCH 801: Drug Quality Assurance and Total Quality Management**

The importance of Quality Control of Pharmaceuticals, Veterinary medicines and Agrochemicals, Personnel, facilities and Documentation, Standard Operating Procedures (SOPs), Pharmacopoeia Monographs (USP, BP, BPC, EuP etc.). Relevant equipment and manuals needed to establish a standard Drug Quality Control Laboratory; Regulatory Aspects of Drug and Chemicals: Quality Control, Functions of Regulatory bodies such as WHO, NAFDAC, PCN, PGMAN, FMOH, IPAN etc. Total Quality Management (TQM).Quantitative Aspects of Pharmaceutical Analysis: Acid- Base titrimetry, Redox titrimetry, Gravimetry, Separation Techniques – Extraction Methods and Chromatography (TLC,CC, HPLC, GC, GC/MS, Super Critical Fluid Chromatograph), Electrochemistry Capillary Electrophoresis, UV/Visible Spectroscopy, Fluorescence/Phosphorescence, Atomic Absorption Spectroscopy (AAS), Validation of Analytical procedures.

**PCG 802: Pharmaceutical Analysis of Natural Drug Products**

Extraction efficiency and purification methods: Chromatographic, biosynthetic techniques, advanced treatment of chromatographic techniques (Adsorption CC, TLC, VLC), Partition (PC, GC, etc.), HPLC, Gel Filtration, electrophoresis, ion-exchange separation, Droplet counter current (DCCC) e.tc. Titrimetric and gravimetric methods. Modern Instrumental methods in structure elucidation (e.g. UV/Visible, IR, NMR, Mass spectroscopy). Assessment of purity, quantification, and derivatization of natural products.

**PCG 803: Advanced Phytochemistry**

Advanced phytochemistry of the following groups (i.e. Natural sources, biosynthesis, study of isolation, chemical properties, and bioactivities) of alkaloids, terpenoids (mono-, sesqui-, diester, tri- and tetraterpenoids), carotenoids, butadeinolides, anthraquinones, flavonoids and other groups.

**PCG 806: Cultivation, Conservation and Biodiversity of Medicinal Plants**

Historical developments of cultivated plants. Drug plant propagation techniques examples from common drugs e.g. Digitalis, Opium, Ginger, Cannabis, Nutmeg, Cinnamon (etc.). Development of cultivation, Propagation and Conservation Methods for established Nigerian Medicinal Plants (e.g. those in the African Pharmacopoeia) as raw materials. Factors affecting plant growth e.g. environmental factors, growth hormones and inhibitors etc. Phenotypic effects on variation during cultivation, tissue culture of medicinal plants, possibilities, and prospects of drug plant production in Nigeria- economic factors, genetic consideration and selection in plant breeding, study of the different factors affecting collection, drying and storage of crude drugs. Conservation techniques, environmental implications, biological and biocultural diversities.

**BTN 805: The practice of Taxonomy**

Field and Herbarium techniques, Nomenclature, Evolutionary trends; the data of Taxonomy, (morphology, anatomy, embryology, palynology); handling and presenting taxonomic data.

**RSC 821: Regulation of Pharmaceutical, Biologic Products and Medical devices**

The course will explore the relationships between scientific discovery, testing and regulatory oversight. It will look at the rules governing prescription and over-the-counter drugs and look at the changes that are introduced by the burgeoning influence of genetic engineering and biological product development. It will consider the practical issues facing regulatory specialists as they work with the NAFDAC and other international regulatory bodies to secure and keep product approval. Legal framework for drug regulation ethical issues in drug/biologic/device development and drug/biologic/device use; global regulatory guidance approaches; types of communications with NAFDAC, including Investigational New Drug (IND) application, New Drug Application (NDA), and Abbreviated New Drug Application (ANDA) requirements, and clearance and Premarket Approvals / Biologics Licensing Applications (PMA/BLA) approval requirements; chemistry, manufacturing, and control (CMC) issues; and post-marketing topics.

**PCT 853: Formulation of Dosage Forms**

Physical properties of drugs and formulations particles size, solubility, partitioning effect, polymorphism, salt formation, cohesiveness and compressibility, interfacial tension and rheology.

Measurement and interpretation of rates of dissolution; Methods of estimating bioavailability and *in-vitro* and *in-vivo* correlation.

Chemical characteristics of drug molecules and formulation, influence of temperature, hydrolytic degradation, oxidative degradation, racemisation, photolytic degradation, drug-excipient, and drug-drug interactions.

Formulation ingredients – surfactants, hydrocolloids, stabilizers, manufacturing additives etc.

Modification of activity of medicaments by physical and chemical methods, control of drug release, ranking of drugs and several formulations of one drug release.

**PCT 862: Laboratory Course in Pharmaceutical Technology**

Preparation and standardization of starch from tubers of *Manihot utilissima*. Preparation of starch granules and estimation of granule properties including bulk density, true density, porosity, flow rate and size analysis. Formulation, manufacture, and standardization of various tablets by direct compression, dry and wet granulation. Dissolution rate studies of granules and tablets. Formulation, manufacture and evaluation of suspensions, emulsions, ointment, and creams. Rate of decomposition and rate of reaction studies at various temperature, pH and relative humidity. Determination of shelf life of various formulated products. Demonstrations in pharmaceutical formulations, dispensing, tableting etc.

**PHA 805: Toxicology**

Introduction to principles of toxicology, types of toxicology, application of toxicology, classification of toxic agents and sources of toxins; Toxicokinetics- Absorption, distribution, biotransformation, elimination, and compartment models; Effects of chemicals, toxicological effects (including toxicology of the CNS, liver, kidney, blood and reproductive system), exposure/rate, chemical interaction, dose-response relationship. Risk assessment and regulatory toxicology. Chemical carcinogenesis, definition, classification and mechanism of chemical carcinogens. Teratogenesis, definition, classification, principles of teratology, examples of teratogens; Pesticide toxicology, insecticides, rodenticides, herbicides, fumigants etc.; Heavy metal toxicology; Clinical toxicology, poison identification and management.

Toxicology testing- in vivo, in vitro, experimental, teratogenesis, acute, sub-chronic and chronic toxicity testing, mutagenic and carcinogenic toxicity testing