

Institute of Ethnobiology

Jiwaji University, Gwalior

SYLLABUS

PRESCRIBED FOR THE

Degree of the Masters of Science

In

**MEDICINAL PLANTS AND HERBAL
RESOURCE MANAGEMENT**

Under Semester System of Examination

(Academic Session 2011-2012)

&

2012-2013

SYLLABUS 2011-2012 & 2012-2013

Master of Science in **Medicinal Plants & Herbal Resource Management** course shall comprise of four semesters of six months duration each. The following is a summary of the course, which is followed by detailed descriptions.

M.Sc. in Medicinal Plants and Herbal Resource Management : Theory and Practical Courses.

Semester – I	<u>IA (Marks)</u>	<u>EE (Marks)</u>
MPHRM/101- Phytodiversity & Conservation	15	35
MPHRM/102 - Ethnobotany & Traditional Systems of medicine	15	35
MPHRM/103 - Fundamentals of Biochemistry	15	35
MPHRM/104 - Pharmacognosy of Medicinal Plants	15	35
MPHRM/105- Lab Course-	-	50
MPHRM/106- Lab Course-	-	50
Semester – II		
MPHRM/201 - Plantation Technology & Resource Management	15	35
MPHRM/202 - Aromatic Plants, Nutraceuticals And cosmeceuticals	15	35
MPHRM/203 – Marketing Management	15	35
MPHRM/204 –Analytical Techniques & Computer Application	15	35
MPHRM/205- Lab Course	-	50
MPHRM/206- Lab Course	-	50
Semester – III		
MPHRM/301 – Downstream processing Of herbal drugs	15	35
MPHRM/302 – Marketing Research & Statistics	15	35
MPHRM/303 – Pharmacology of Herbal Drugs-I	15	35
MPHRM/304 – Pharmacology of Herbal Drugs-II	15	35
MPHRM/305 - Lab Course	-	50
MPHRM/306- Lab Course	-	50
Semester – IV		
MPHRM/401 – Financial Management	15	35
MPHRM/402 – Pharmaceutical laws, IPR & small scale Entrepreneurship.	15	35
Lab Course	-	50
Training and Project work		
Presentation of Project Work (Visit to field and relevant organization).	50	100

Semester – I

MPHRM - 101: Phytodiversity and Conservation.

Unit – I

- Phytodiversity: The global perspectives
- Phytogeographic regions of India .
- Phytodiversity of important medicinal plants in aquatic environment.
- Genetic diversity of medicinal crops in India.

Unit – II

- Hot spots of the world with special reference to India.
- Endemism
- Threatened categories of Plants, IUCN & CITES.
- Red Data Book with reference to India.

Unit – III

- Preliminary idea on major taxonomic characters and technical description of plants.
- ICBN, Some local medicinal plants in context to occurrence and taxonomic characters.
- NMPB, NBPGR, AYUSH
- BSI, FRI, NBRI, CCRAS

Unit – IV

- International Convention, Treatises and Protocols for Biodiversity Conservation.
- Legal Coverage on Biodiversity Conservation in India.
- Asian Regional Agreement on Biodiversity.
- Green people & Green organization in Biodiversity Conservation.

Unit- V

- Bioprospecting
- Phytodiversity erosion in India.
- Methods of In-situ and Ex-situ conservation of plants.
- Convention on Biological Diversity (CBD)

MPHRM- 102 : Ethnobotany & Traditional Systems of Medicine

Unit – I

- Ethnobotany & its interdisciplinary approach.
- Important tribal communities of the world and India: Life style & ethnobotanical aspects.
- Wild plants in Indian folk life: faith, taboos, totems, sacred groves etc.
- Plants used by tribals in scarcity, emergency and supplementary food. ethnoveterinary medicinal plants .

Unit –II

- History and principles of Ayurveda, Homeopathy, unani, Siddha, Tibetan & Amchi systems of medicine. Tridosha theory of ayurveda.
- Ethnobotany & its role in conservation of plant genetic resources.
- Narcotic plants, their properties with special reference to India.
- Poisonous plants, their properties with special reference to India

Unit – III

Description, distribution, properties and medicinal uses of the following species:

Phyllanthus emblica, Aegle marmelos, Cassia fistula , Oroxyllum indicum, Helicteres isora, , Azadirachta indica, Wrightia tinctoria,. Holarrhena pubescens, Saraca asoca, Terminalia arjuna, Terminalia chebula

Unit – IV

Holoptelea integrifolia, , Pongamia pinnata, Pterospermum marsupium, Santalum album, Mimosa elengi. Acorus calamus, Abrus precatorius, Achyranthus aspara, , Mucuna pruriens, Convolvulus pluricaulis.

Unit- V

Classification of plants in ancient literature (On the basis of habit and properties)
Plants in some important sanskrit literature (Vedas,Vrikshayurveda, Samhitas, Nighantus etc.)

MPHRM - 103 : Fundamentals of Biochemistry

Unit-I

- Carbohydrates: Introduction, monosaccharides, oligo saccharides and polysaccharides.
- Cyclic structure of glucose, metabolism of mono saccharide,
- Energetic of physiological oxidation of carbohydrates,
- Disorders of carbohydrate metabolism.

Unit – II

- Lipids: Introduction , classification
- Chemistry of Lipids
- Metabolism of lipids β -oxidation of fatty acids and biosynthesis. .
- Disorders of lipid metabolism.

Unit – III

- Amino acids and Proteins
- Polypeptides and protein configuration
- Classification of proteins & some basic protein disorders.
- Broad outline of protein metabolism.

Unit – IV

- Enzymes: Introduction, Classification,
- Enzyme kinetics,
- Mechanism of enzyme substrate complex formation
- Enzyme inhibition, Enzyme regulation.

Unit –V

- Hormones: Introduction, Classification
- Mechanism of action,
- Hormones of thyroid, adrenal glands,
- Hormones of pituitary, pancreas and gastrointestinal tract.

MPHRM – 104 : Pharmacognosy of Medicinal Plants

Unit –I

- History and scope of pharmacognosy to various systems of medicine,
- Classification of crude drugs
- Introduction to various parts (External and internal) of medicinal plants.
- Drug adulteration and substitutes.

Unit- II

Evaluation of drugs: Organoleptic, anatomical, physical and biological.

Unit – III

Classification, chemical constituents, properties and biological source of the following:

Tannins, Glycosides, Saponins, Latex and Terpenoides

Unit – IV

Alkaloids : Occurrence, classification, isolation, properties, structure and uses.

Occurrence, Classification and properties of phenolic compounds.

Unit- V

- Medicinal Herbs and Transgenic plants.
- Plant Tissue culture as source of Biomedicinals.
- Biogenesis of Phytopharmaceuticals.

Semester – II

MPHRM - 201 : Plantation Technology and Resource management

Unit I

- Natural methods of plants propagation.
- Methods of manuring and composting
- Vermicomposting
- Organic Farming

Unit II

Distribution, taxonomic characters, properties and methods of cultivation of the following :

- Buch, Chitrak, Aloe,
- Satavar, Brahmi, Haldi
- Safed musli, Kalmegh, Dam bel

Unit III

Distribution, properties and methods of cultivation of :

- Harad, Bahera, Aonla,
- Guggal, Gudmar, Sarpagandha,
- Ashvagandha, Punarnava, Giloy,

Unit IV

- Important weeds and methods of their eradication.
- Important diseases of medicinal plants.
- Herbal Pesticides and Nematicides.
- Post Harvest Management: storage, Packaging and Transportation.

Unit V

- Tea and coffee plantation; Tea industry in India.
- Mushroom cultivation in India
- Waste land development through medicinal plants.

MPHRM - 202 : Aromatic Plants, Nutraceuticals and cosmeceuticals

Unit I

- Scope, distribution and properties of important aromatic plants with special reference to the following :
- Mint, *Cymbopogon*, *Vetiver*, *Eucalyptus*
- Rose, Jasmine and *Pelargonium*.
- Terpentine and terpene chemicals.

Unit II

- Culinary herbs : Production, trade and marketing.
- Important Indian spices, their properties and quality evaluation.
- Important Indian condiments: Cultivation and properties

Unit III

- Distribution and extraction of essential oils in plants.
- Herbal products with reference to flavoring and coloring agents.
- Perfumes and Incenses.

Unit IV

Occurrence, cultivation , chemical constituents and properties of the following aromatic plants : *Cinnamomum*, *Pandanus*, Cedar wood, Agar wood and Sandal wood.

Unit V

- An introduction to Ayurvedic Pharmacy and its formulations.
- Herbal Nutraceuticals
- Herbal Cosmeceuticals

MPHRM – 203 : Marketing Management

Unit – I

- Introduction to marketing, Indian consumer market; marketing organization, marketing segmentation; Process of marketing; Marketing of services; GMP (Good marketing principles). The Indian market: Emerging panorama.

Unit – II

- Planning of marketing-mix: product mix; Pricing policies and practices. Promotion-mix, channel-mix, public relation; People management.

Unit – III

- Product definition; Classification level of a product; FMCG and its characteristics; Product mix; product line decision; competitive product differentiation; PLC (Product lifecycle) and marketing strategies in various stages. New challenges for marketers in India.

Unit – IV

- Product planning system (Matrix approach) Organization for new product developments; New product adoption and diffusion process; Producer and Middleman criteria.

Unit- V

- Integrated approach to new product development, Generation, Screening and development of new product idea, Economic analysis, Test marketing and new product Launch.

MPHRM – 204 : Analytical Techniques and Computer Application.

Unit – I

General studies of the following:

- Solvent extraction and centrifugation
- Chromatography: Theory and principle of :
Adsorption, Column, TLC, Paper, Ion Exchange

Unit – II

General studies of the following:

- i). GLC ii). HPLC iii). Electrophoresis and iv) PCR.

Unit – III –

Spectrophotometry : General and basic Idea of UV- Spectrophotometry
Emission and absorption spectrophotometry (AAS, FP), ESR and NMR.

Unit - IV

Analytical methods for estimation of carbohydrates, proteins and lipids,

Unit-V:

- Introduction to MS office.
- Introduction to programming, difference between high level and low level programming.
- Essentials of programming with BASIC.
- Artificial intelligence, Computer graphics, Information retrieval.

Semester - III

MPHRM/301: Downstream processing of Herbal drugs.

Unit – I

- **Distillation** : Introduction; Batch and continuous distillation, separation of azeotropes, plate columns and packed columns.
- **Absorption**: Introduction, Equipments – packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contractors.
- **Evaporation**: Introduction; Equipments short tube (standard) evaporator, forced circulation evaporator, falling film evaporators, climbing film (upward flow) evaporators, wiped (agitated) film evaporators.

Unit – II

- **Filtration**: Introduction, Filter media and filter aids, Equipment – Plate and frame filter press, sinter filter, rotatory drum filter, sparkler filter, candle filter, bag filter, centrifuge.
- **Drying**: Introduction; free moisture, bound moisture, drying curve, equipments – tray drier, rotary dryer, flash dryer and spray dryer.

Unit – III

- **Crystallization**: Introduction: Solubility, supersaturation, nucleation, crystal growth, Equipment -tank crystallizer, agitated crystallizer, evaporator crystallizer, draft tube crystallizer.
- **Extraction**: Introduction: selection of solvents, Equipments – spray column, packed column rotating disc column, mixer settler.

Unit- IV

- **Mixing**: Theory of mixing solid, Basic mixing equipments for solid, solid-liquid and liquid – liquid mixing.
- **Size Reduction and size Separation**: Definition, objectives of size reduction, factors affecting size reduction. Ball Mill, Hammer Mill.

Unit – V

- Properties and Methods of preparation of the following drugs :
Vati (Tablet), Kwath, Asav, Arishta, Avaleha, Satva and Churna (Powder) Bhasma.

MPHRM/ - 302: Marketing Research and Statistics.

Unit – I

Introduction to MIS: - Marketing Research, Nature, Scope, Importance and Limitations of Marketing research; (Types of marketing research); Marketing Research Process; Ethical issues in M.R.; M.R. in India.

Unit - II

Research design sampling procedures of problems. Methods and tools of data collection; Analysis and interpretation of data (including statistical evaluation). Questionnaire and its types.

Unit – III

Business Mathematics: - Arithmetic and geometric progressions, addition, subtraction and multiplication of matrices. Inverse of matrix.
Limits, Differentiation of single variable, maxima and minima for functions of one variable. (Simple problems). Business Problems relating to AC, MC, AR & MR by maxima and minima.

Unit – IV

Data Analysis: - Computation and application of mean, mode, and median, Standard deviation,
Analysis of variance.
Tests of Significance
Correlation and Regression.

Unit- V

Application of Probability, Binomial, Poisson and Normal Distribution
Growth curve: Exponential and Logarithmic.
Principles of experimental design, Randomization, Replication and Local Control.

MPHRM / 303: Pharmacology of Herbal Drugs- I

Unit- I

Pharmacology: Scope and disciplines Pharmaco-kinetics and Pharmacodynamics, principles of therapeutics, Drug receptor theory, Adverse effects of drugs, Drug doses.

Unit – II

- Narcotic plants, their properties, constituents with special reference to India.
- Poisonous plants, their properties, constituents with special reference to India.
- Important groups of ayurvedic drugs, their constituents & action: Triphla, Ashtaverga ,
- Panchavalkarishta and Dashmularishta.

Unit- III

Important herbal pharmaceuticals & their products with special reference to India (Dabur, Zandu, Himalaya, Vaidyanath, Hamdard etc.)

Unit - IV

Occurrence, constituents and mode of action of following medicinal plants, used against the following disorders:

- (a) **Skin** (*Azadirachta indica*, *Psoralea corylifolia*, *Plumbago zeylanica*)
- (b) **Burns/ Boils** (*Anethum sowa*, *Calendula officinalis*, *Murraya koengii*)
- (c) **Leprosy** (*Triumfetta rhomboidea*, *Argemone Mexicana*, *Commelina benghalensis*)

Unit –V

Occurrence, constituents and mode of action of medicinal plants/herbal drugs used against the following :

- (a) **Asthama** (*Adhatoda vasica*, *Tylophora indica*, *Ephedra* sp)
- (b) **Teeth** (*Solanum surratense*, *Piper nigrum*, *Spilanthes acmella*)
- (c) **Tuberculosis** (*Withania somnifera*, *Barleria prionitis*, *Zingiber officinalis*)

MPHRM/304 – Pharmacology of Herbal Drugs - II

Unit – I

Occurrence, constituents and mode of action of medicinal plants/herbal drugs used against the following disorders :

- (a) **Cardiac** : (*Rouvolfia serpentina*, *Mimosops elengi*, *Terminalia arjuna*)
- (b) **Diabetes**: (*Catharanthus roseus*, *Eugenia jambolana*, *Trigonella foenum graceum*).
- (c) **Liver** : (*Berberis vulgaris*, *Phyllanthus niruri*, *Aloe vera*)

Unit – II

Occurrence, constituents and mode of action of medicinal plants/herbal drugs used against the following disorders:

- (a) **Fever** :(*Tinospora cordifolia*, *Andrographis paniculata*, *Alstonia scholaris*.)
- (b) **Epilepsy/Insomnia** : (*Papaver somniferum*, *Cannabis sativa*, *Datura stramonium*)
- (c) **Cough/ Sore Throat** : (*Syzygium aromaticum*, *Euphorbia hirta*, *Ocimum sanctum*)

Unit – III

Occurrence, constituents and mode of action of medicinal plants/herbal drugs used against the following :

- (a) **Helminthiasis** : (*Swertia chirata*, *Embelia ribes*, *Cassia angustifolia*)
- (b) **Anaemia** : (*Chichorium intybus*, *Hygrophila spinosa*, *Benincasa hispida*)
- (c) **Gastro-intestinal** : (*Trachyspermum ammi*, *Plantago ovata*, *Aegle marmelos*).

Unit – IV

Occurrence, constituents and mode of action of medicinal plants/herbal drugs used against the following :

- (a) **Rheumatism/ Arthritis** : (*Cissus quadrangularis*, *Bauhinia purpurea*, *Vitex negundo*).
- (b) **Ophthalmic** : (*Hardwickia binata*, *Berhaavia diffusa*, *Abutilon indicum*)
- (c) **Gynogenic /Delivery** : (*Saraca asoka*, *Achyranthes aspera*, *Urgenia indica*).

Unit – V

Important medicinal plants of Madhya Pradesh and their uses by local tribes against various diseases

Semester – IV

MPHRM/ 401: Financial Management

Unit – I

- **Introduction:** nature, concept of finance function and its relationship with other functional areas of Management. Objective of financial management, function & responsibilities of financial executives. Financial planning and financial forecasting.

Unit – II

- **Capital Structure Planning:** Concept of leverage, Types of leverage – operational & financial meaning of Capital Structure; features of an appropriate capital structure; factors affecting capital structure; Capital structure Approaches: Operating & Financial leverage approach; other consideration – Control, flexibility, marketability, flotation capital.

Unit – III

- **Working Capital Management:** Concept of working capital; Need for working capital. Approaches to the financing of current assets. Motives for holding cash; credit policy.

Unit – IV.

Objectives of Inventory Management. Inventory Management Techniques, EOQ Safety Stock; Sources of working capital finance.

Unit – V

- Reciprocal relationship between retained carryings and cash dividend. Impact of dividends on the valuation of firm. Determinants of dividend policy – Dividend payment ratio, Stability of Dividend, legal, contractual and internal constraints and Restriction, Owner's consideration, capital market consideration, financial need of the company. Forms of Dividend – Cash Dividend, Bonus Shares/Limitations of Bonus Shares.

MPHRM/402 : Pharmaceutical Laws, IPR & Small Scale Entrepreneurship

Unit – I

- Pharmaceutical legislation in India, pharmacy Act 1948,
- The drugs and cosmetics Act 1940
- Narcotic Drugs and Psychotropic Substances Act 1985,
- Poisons Act 1919, Important schedules in some important aspects of drugs.

Unit – II

- Intellectual property Rights; Intellectual property, patents, conditions of patentability,
- steps to obtain a patent
- sources of patent information
- patent application forms.

Unit- III

- Copy right, copy right protection, copyright forms,
- Trademark
- Geographical Indications
- WTO, TRIPS, CBD.

Unit – IV

- Scope & Status of Small Scale Herbal Enterprises in India
- Procedure for establishing small scale herbal enterprise.
- Funding resources for establishing small scale entrepreneurship.
- Some important organizations for providing Training in establishing small scale Herbal industries in India (CEDMEP etc.)

Unit – V

- Source and manufacturing of jam, jelly, sauce, soft drinks etc.
- Some important herbal anti-repellants, dyes and Incense sticks.
- Plant materials used for making ropes, cordages, mattresses and cloth fibres.
- Folk art of India & Small scale entrepreneurship.

Books Suggested for M.sc in MPHRM.

1. Biodiversity Endangered by A B Chaudhuri and D D Sarkar.(Scientific Publishers India)
2. Biodiversity and its Conservation in India by S S Negi (Indus Publishing Company New Delhi)
3. Plant Systematics Theory and Practice by Gurcharan Singh (Oxford and IBH Publishing Co.Pvt. Ltd.)
4. Global Biodiversity by R K Sinha ,D Singh (INA Shree Publishers Jaipur India)
5. A hand book of Ethnobotany by S K Jain and V Mudgal.(Bishen Singh and Mahindra Pal Singh; Dehradun India)
6. A Manual of Ethnobotany by S K Jain (Scientific Publishers)
7. Glimpses of Indian Ethnobotany: By S.K.Jain (Oxford & IBH Publisher).
8. Indian Folk medicines and other plant based products by V singh (Scientific Publishers)
9. Text book of Biochemistry by J Stenesh (CBS publishers and Distributers)
10. Biochemistry by JM Berg, J L Tymoczko and L Stryer. (W.H. Freeman and Company, New York.)
11. Lehninger Principles of Biochemistry by DL Nelson and MM Cox. (W.H. Freedom and Company,New York).
12. Test book of pharmacognosy by Mohmmed Ali (CBS Publishers and Distributers)
13. Pharmacognosy by C K Kokate, A P Purohit, S B Gokhale (Nirali Prakashan)
14. Chemical uses of Medicinal Plants by P V Sharma (Oriental publishers and distributers)
15. Essentials of Medicinal Pharmacology by K D Tripathi (Jaypee Publishers)
16. The medicinal and poisonous plants of India by J F Caius (Scientific Publishers India)
17. Cultivation and Processing of selected Merdicinal plants by BIIR board of consultants and Engineers (Asia Pacific Busines Press)
18. Ethnopharmacology Recent Advancess by P Pushpangadan, V George nd KK Janardhan (Daya Publishing House)

19. Multifacial application of Drug Plants by D R Khanna, A K Chopra, G Prasad, D S Malik and R Bhutiani
20. Medicinal Plants Conservation, Cultivation and Utilization by A K Chopra, D R Khanna, G Prasad, D S Malik, R Bhutiani (Daya Publishing House)
21. A handbook of Aromatic and Essential oil plants cultivation, chemistry, processing and uses by S Bedi, Tanuja and S P Vyas (Agrobios)
22. Cultivation and Utilization of Aromatic Plants by H Panda (Asia Pacific Business Press)
23. Handbook of Medicinal Herbs by J A Duke, M J B Godwin, J Ducellier and P A k Duke (CRC Press)
24. The treatise on Aromatic plants by R C Upadhyaya (Anmol Publications Pvt. Ltd)
25. Principles of Instrumental Analysis by Holler, Skoog and Crouch (Thomson)
26. Vogel's Test book of Quantitative Chemical Analysis by J Mendham, R C Denney, J D Barnes and MJK Thomas.
27. Spectroscopy by G R Chatwal and S K Anand (Himalaya Publishing House)
28. Marketing Management by Kotler & Kellet (Pearson education)
29. Marketing by M J Etzel, B J walker, W J Stanton (TATA McGraw Hill)
30. Marketing Management Planning, Implementation and Control by V S Ramaswamy & S Namakumari (Macmillan)
31. Intellectual Property Laws (Universal Law Publishing Co. Pvt.Ltd)
32. Drugs and Cosmetics Act, 1940 by Vijay Malik (Eastern Book Company)
33. Intellectual Property Law in India by Justice P S Narayana (GOGIA Law Agency)
34. Intellectual Proprtty Rights by P Ganuli (TATA McGraw Hill)
35. Drus and Cosmetics Act, 1940 by Vijay Malik (Eastern Book Company)
36. Complete Small Scale Industries – By Rajeev Vishvakarma (Manoj Pocket Books)

