



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

CURRICULUM DESIGNING COMMITTEE

- | | |
|--|----------|
| 1. Dr. Bodke S.S.
Yeshwant Mahavidyalaya, Nanded | Chairman |
| 2. Dr. Kadam A.S.
D.S.M. Mahavidyalaya, Jintur | Member |
| 3. Dr. Mandge S.V.
Shri. SGM College, Loha | Member |
| 4. Dr. Gawai D.U.
Science College, Nanded | Member |
| 5. Dr. Dakore H.G.
P.N.College, Nanded | Member |
| 6. Dr. Aithal S.V.
Vai. D.M.Mahavidyalaya, Degloor | Member |
| 7. Dr. Biradar S.D.
D.S.M.College, Parbhani | Member |
| 8. Dr. Bhadraiah B.
Osmania University, Hyderabad | Member |
| 9. Dr. Patil D.A.
SSVP's Dr. Ghogre Science College, Dhule | Member |
| 10. Dr. Mukadam D.S.
Green Gold seeds Ltd., Walunj | Member |
| 11. Dr. Gacche R.N.
SRTM University, Nanded | Member |



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

INTRODUCTION

The SRTMUN is gearing up for several initiatives towards academic excellence, quality improvement and administrative reforms. In view of this priority and in-keeping with Vision and Mission; process was already initiated towards introduction of semester system, grading system and credit system. In the recent past, University had already implemented Credit based grading system to campus schools. Now University is going one step ahead to implement Cumulative Grade Point Average (**CGPA**) system for UG and Choice Based Credit System (**CBCS**) for PG in all the affiliated colleges from the academic year **2014-2015**. These regulations shall be called as Choice Based Course Credit System and Grading, 2014. In short it will be referred as **SRTMUN CBCS REGULATION**.

Revision and updating of the curriculum is the continuous process to provide an updated education to the students at large. Presently there is wide diversity in the curriculum of different Indian Universities which inhibited mobility of students in other universities or states. To ensure and have uniform curriculum at UG and PG levels as per the **SRTMUN CBCS REGULATION**, curriculum of different Indian Universities, syllabus of NET/SET, MPSC, UPSC, forest services and the UGC model curriculum are referred to serve as a base in updating the same.

The M.Sc. Herbal medicine (General) semester pattern course is running in different affiliated colleges of the SRTMUN. The course content has been designed on CBCS pattern. The course content of each theory paper is divided into units by giving appropriate titles and subtitles. For each unit, total number of periods required, weightage of maximum marks and credits are mentioned. A list of practical exercises for laboratory course work based on theory papers to be completed in the academic year is also given. A list of selected reading material and a common skeleton question paper for all the theory papers of semester-III&IV are also provided at the end of the syllabus.

Dr. BODKE SHRIRANG SATWAJI
Chairman, BOS in Herbal medicine,
SRTMU Nanded



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

OBJECTIVES

1. To provide an updated education to the students at large in order to know the importance and scope of the discipline and to provide mobility to students from one university or state to other.
2. To update curriculum by introducing recent advances in the subject and enable the students to face NET, SET, UPSC and other competitive examinations successfully.
3. To impart knowledge of Herbal medicine as the basic objective of Education
4. To develop a scientific attitude to make students open minded, critical and curious
5. To develop an ability to work on their own and to make them fit for the society
6. To expose the students to contribute in different pharmaceutical industries and research institutes.
7. To develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of herbal products and their utilization.
8. To make aware of natural resources and environment and the importance of conserving the same.
9. To develop ability for the application of the acquired knowledge in the fields of life so as to make our country self reliant and self sufficient.
10. To appreciate and apply ethical principles to herbal medicine research and studies.

Dr. BODKE SHRIRANG SATWAJI
Chairman, BOS in Herbal medicine,
SRTMU Nanded



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM

CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

SEMESTER-III

An Outline:

Paper number & Title	Credits (Marks)			Periods
	External: ESE	Internal: CA	Total Credits (Marks)	
Theory Paper-XI: Natural Plant Products	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
Theory Paper-XII: Medicinal plant Biotechnology	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
*Elective				
*Theory Paper-XIII: Fermentation technology (Elective)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
*Theory Paper-XIV: Herbal drug Technology (Elective)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
Theory Paper-XV: Seminar	-	Credit: 01 (Marks:25)	Credits: 01 (Marks:25)	-
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 17 (Marks:425)	240

(ESE: End of semester examination, CA: Continuous assessment, *: Elective paper)



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM

CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

SEMESTER-IV

An Outline:

Paper number & Title	Credits (Marks)			Periods
	External: ESE	Internal: CA	Total Credits (Marks)	
Theory Paper-XVI: Herbal drug development	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
Theory Paper-XVII: Herbal cosmetics	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
*Elective				
*Theory Paper-XVIII: Drug standardization and regulations (Elective)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
*Theory Paper-XIX: Herbal drug action (Elective)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignments: 10marks)	Credits: 04 (Marks:100)	60
Theory Paper-XX: Seminar	-	Credit: 01 (Marks:25)	Credits: 01 (Marks:25)	-
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 17 (Marks:425)	240

(ESE: End of semester examination, CA: Continuous assessment, *: Elective papers)



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

LABORATORY COURSE WORK
(ANNUAL PATTERN)

An Outline:

Paper number & Title	Credits (Marks)			Practicals
	External: ESE	Internal: CA	Total Credits (Marks)	
Laboratory Course Work-V: Based on theory paper-XI&XII	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
*Laboratory Course Work-VI: Based on theory paper-XIII&XIV	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Laboratory Course Work-VII: Based on theory paper-XVI&XVII	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
*Laboratory Course Work-VIII: Based on theory paper-XVIII&XIX	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Total	Credit: 12 (Marks: 300)	Credit: 04 (Marks:100)	Credits: 16 (Marks:400)	60

(ESE: End of semester examination, CA: Continuous assessment, *: Elective paper)



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SEMESTER-III
THEORY PAPER-XI: NATURAL PLANT PRODUCTS

Periods: 60

Credits: 04

UNIT-I: RESINS AND TANNINS (15 periods)

Resins: Study of Drugs Containing Resins and Resin Combination like colophony, Podophyllum, jalap, cannabis, capsicum, myrrh, asafoetida, balsam of tolu, balsam of Peru, benzoin, turmeric, ginger; Tannins: Study of tannins and tannin containing drugs like gambir, black catechu, gall and myrobalan.

UNIT-II: VOLATILE OILS (15 periods)

General methods of extraction of volatile oils from plants, Study of biological source, chemical constituents, chemical tests and uses of volatile oils of Mentha, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Nutmeg, Chenopodium, Valerian, Musk, Palmarosa, Gaultheria Detailed Pharmacognosy of Clove, Coriander, Fennel, Sandal wood, Cardamom, Cinnamon and Eucalyptus, Natural allergens and photosensitizing agents, Antioxidants from plant origin.

UNIT-III: DRUG GROUPS (15 periods)

General methods of isolation and preliminary phytochemical screening of glycosides. Study of biological source, cultivation, collection, chemical constituents, adulterants, uses, macroscopic, microscopic features and chemical tests of following drug groups

Drug containing Saponin: Liquorices, ginseng, Dioscorea, Sarsaparilla and Senega,

Drug containing Cardio active sterols: Digitalis, squill and strophanthus,

Drug containing Anthraquinone cathartics: Aloes, senna, rhubarb and cascara,

Others: Psoralea, gentian, saffron, chirata and quassia

UNIT-IV: ENZYMES (15 periods)

Biological sources, preparation, identification tests and uses of the following

Enzymes: Diastase, papain, pepsin, trypsin, pancreatin. General techniques of biosynthetic studies and basic metabolic pathways. Biogenesis of aromatic amino acids, steroidal glycosides, tropane alkaloids and indole alkaloids.

LABORATORY COURSE WORK BASED ON PAPER-XI:

1. Identification of crude drugs mentioned in theory (at least 5)
2. Study of pharmaceutical aids.
3. Microscopic studies of seven selected crude drugs and their powders mentioned in
4. Theory and their chemical tests.
5. Identification of crude drugs listed in theory (Any five)
6. Microscopic study of at least four drugs including the powder study listed in theory.
7. Specific identification tests for some crude drugs listed in theory



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SEMESTER-III

THEORY PAPER-XII: MEDICINAL PLANT BIOTECHNOLOGY

Periods: 60

Credits: 04

UNIT-I: GENETICS AND MOLECULAR BIOLOGY (15 periods)

Introduction to Genetics and Molecular Biology: structural, molecular and chromosomal organization of cell, cytogenetics, cell cycle, mitosis and meiosis, genetic code and gene mutation, genetic engineering, genetic mapping and molecular maps of plant genomes Plant genetics: Reproduction in plants, Variation in plants, Heritability, Gene Recombination and Basis of plant breeding.

UNIT-II: GENE TRANSFER (15 periods)

Gene transfer in plants: Using vectors of Agro bacterium, Ti, Ri, Co-integrative and intermediate plasmid, DNA mediated gene transfer techniques electro oration, micro projection, micro and microinjection, liposome, ultra sonication and localization of transferred gene in genetically modified plants, Plant chromosome analysis, use of markers and DNA hybridization.

UNIT- III: CROP QUALITY IMPROVEMENT (15 periods)

Crop quality improving methods: Chemo demes, Hybridization, Mutation & Polyploidy Applications of transgenic plants: Resistance to physiological stress, insects, fungi, viruses and herbicides, Production of Phytopharmaceuticals and edible vaccines.

UNIT- IV: TISSUE CULTURE (15 periods)

Tissue culture: Laboratory organisation, Media, Aseptic Manipulation.

Culture methods: Organogenesis, Embryogenesis, Micro propagation, Somaclonal, variation, Haploid culture and Synthetic seeds; Strategies for Production of secondary metabolites, Methods: Batch culture, Continuous culture, Hairy root culture and their applications. Production of important secondary metabolites (Ajmalicine, Shikonin, Artemicin, Cinnamic acids and Flavonoids and Anthraquinones)

LABORATORY COURSE WORK BASED ON PAPER-XII:

1. Study of design and organization of plant tissue culture laboratory
2. Anther culture
3. Embryo culture
4. Protoplast isolation
5. Protoplast fusion
6. Meristem culture
7. Micro propagation of endangered medicinal plant



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SEMESTER-III

***THEORY PAPER-XIII: FERMENTATION TECHNOLOGY (Elective)**

Periods: 60

Credits: 04

UNIT-I: PRINCIPLES OF ENZYME CATALYSIS (15 periods)

Proteins as enzymes; Michaelis-Menten kinetics; Kinetics and Statistics; Inhibition; Effect of pH and temperature; Enzymology; Immobilized enzymes: methods, mass transfer considerations; Industrial enzymes

UNIT-II: MICROBIAL GROWTH (15 periods)

Introduction to metabolism; Nutrient transport; Glycolysis; TCA cycle and other pathways; Control of metabolism; Factors affecting microbial growth; Stoichiometry: mass balances; Stoichiometry: energy balances; Growth kinetics; Measurement of growth.

UNIT-III: BIOREACTORS (15 periods)

Introduction to bioreactors; Batch and Fed-batch bioreactors, Continuous bioreactors; Immobilized cells; Bioreactor operation; Sterilization; Aeration; Sensors; Instrumentation; Culture-specific design aspects: plant/mammalian cell culture reactors.

UNIT-IV: BIO SEPARATIONS (15 periods)

Biomass removal; Biomass disruption; Membrane-based techniques; Extraction; Adsorption and Chromatography Adsorption and chromatography: size, charge, shape, hydrophobic interactions, Biological affinity; Process configurations (packed bed, expanded bed, simulated moving beds) Description of industrial processes; Process flow sheeting; Sedimentation; Flocculation; Microfiltration; Sonication; Bead mills; Homogenizers; Chemical lysis; Enzymatic lysis Membrane based purification: Ultrafiltration ; Reverse osmosis; Dialysis ; Diafiltration ; Pervaporation; Perstraction.

LABORATORY COURSE WORK BASED ON PAPER-XIII:

1. Conventional filtration
2. Centrifugation in batch and continuous centrifuge
3. Cell disruption
4. Protein precipitation and its recovery
5. Ion-exchange chromatography
6. Membrane based filtration-ultra filtration in cross flow modules and micro filtration
7. Adsorption process in batch and continuous mode
8. Membrane based purifications.



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SEMESTER-III

***THEORY PAPER-XIV: HERBAL DRUG TECHNOLOGY (Elective)**

Periods: 60

Credits: 04

UNIT-I: INTRODUCTION (15 periods)

Definition of Herbal drug, Importance of Herbal therapies, Herbal verses conventional drugs, Safety in herbal drugs. Toxicity in Herbal drugs and their interactions, General methods of extraction, isolation and purification of phyto-constituents

UNIT-II: PHYTOCONSTITUENTS (15 periods)

Herbs used as nutraceuticals and healing agents;. Isolation, identification tests and estimation methods for the following phytoconstituents with special emphasis on HPLC, HPTLC and other advanced techniques Aloin from Aloes Vasicine from Adhatoda vasica Andrographolides from andrographis paniculata Curcumin from Curcuma longa Piperine from Piper longum Phytochemical study Definition, occurrence, chemistry, isolation, estimation and biogenesis of alkaloids, glycosides, plant phenols, resins, terpenes and terpenoids, phospholipids and steroids Marine natural products

UNIT-III: APPLICATION OF HERBAL MEDICINES (15 periods)

Making and using herbal medicines for common ailments like cold, skin infections and Diarrhea; Analytical Profiles of selected herbs – Brahmi, *Andrographis paniculata* *Aegle marmelos* and *Gymnema sylvestre*. Antimicrobial, anti-inflammatory and antibiotic drugs Screening procedures for herbal drugs with current innovations in following therapeutic classes Antihypertensive Antioxidant Antipyretic & anti-inflammatory Antidiabetic Anticancer Antihepatotoxic Immunomodulatory

UNIT-IV: QUALITY CONTROL OF HERBAL MEDICINES (15 periods)

Quality Control and Quality Assurance of Herbal ingredients as per W.H.O.Guidelines, Determination of tannins, Ash value, Extractable matter and Pesticide residues. Herbal product development Lipid orals, tablets, capsules, dermatologic and herbal cosmetics Methods involved in monoherbal and polyherbal formulations with their merits and demerits

LABORATORY COURSE WORK BASED ON PAPER-XIV:

1. Identification of sugar from plant extracts
2. Preparation of plant extracts and their standardization by analytical profiles (**any five**)
3. Quality Control tests for raw materials used in Herbal preparation
4. Antibacterial activity of selected drugs
5. Antifungal activity of selected drugs
6. Antioxidant activity of selected drugs
7. Determination of ash values of drugs.
8. Estimation of pesticide residues in herbal products.



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

SEMESTER-IV

THEORY PAPER-XVI: HERBAL DRUG DEVELOPMENT

Periods: 60

Credits: 04

UNIT-I: GENERAL METHODS OF PROCESSING OF HERBS (15 periods)

Definition, sources, identification and authentication of herbs, Different methods of processing of herbs like collection, harvesting, garbling, packing and storage conditions, Methods of drying – Natural and artificial drying methods with their merits and demerits.

UNIT-II: METHODS OF PREPARATION OF EXTRACTS (15 periods)

Principles of extraction and selection of suitable extraction method, Different methods of extraction including maceration, percolation, hot continuous extraction, pilot scale extraction and supercritical fluid extraction with their merits and demerits, Purification and Recovery of Solvents.

UNIT-III: ISOLATION AND ESTIMATION OF PHYTOCONSTITUENTS (15 periods)

Different methods (including industrial) for isolation and estimation of phytoconstituents from the following drugs (with special emphasis on HPLC and HPTLC),

1. Hypericin / Hyperforin from Hypericum species.
2. Forskoline from Coleus forskoli.
3. Catechins from Green tea.
4. L-Hydroxy citric acid from Garcinia combogia.
5. L-Dopa from Mucuna pruriens.
6. Andrographolides from Andrographis paniculata.
7. Alicin from Garlic.
8. Piperine from Piper nigrum / Piper longum.
9. Bacosides from Bacopa monnieri.
10. Berberine from Berberis aristata.

UNIT-IV: HERBAL FORMULATION DEVELOPMENT (15 periods)

Selection of herbal ingredients, Different dosage forms of herbal drugs, Evaluation of different dosage forms, Stability studies of herbal formulations.

.....
LABORATORY COURSE WORK BASED ON PAPER-XVI:

1. Preparation of some important extracts by using Pilot Scale Extraction Plant
2. Isolation and estimation of phytoconstituents by HPTLC listed in chapter
3. Volatile oil Analysis by Gas chromatography
4. Spectroscopic analysis of some isolated compounds
5. Estimation of phytoconstituents in mono and polyherbal formulations by HPTLC technique



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SEMESTER-IV
THEORY PAPER-XVII: HERBAL COSMETICS

Periods: 60

Credits: 04

UNIT-I: COSMETIC TECHNOLOGY-I (15 periods)

Fundamentals of cosmetic technology, classification of cosmetics, A brief study of raw materials used for Cosmetic preparations: surfactants, humectants, cream bases, aerosol propellants, perfumes, colours.

UNIT-II: COSMETIC TECHNOLOGY-II (15 periods)

Stability aspects of cosmetics: Shelf-life, effects of environmental factors like light, temperatures etc on product stability. Quality control tests of different cosmetic products, Packaging of Cosmetics

UNIT-III: HAIR AND SKIN CARE PRODUCTS (15 periods)

Hair Care Products: Hair structure, Shampoos, Conditioners, Setting lotion, Hair creams, Hair dyes. Skin Care Products: Anatomy and physiology of skin, formulation of skin cleaners, moisturizers, sunscreen products, acne products, anti ageing creams.

UNIT-IV: TYPES OF COSMETICS (15 periods)

Coloured Cosmetics: Introduction, lip colour, nail polish and face make-up eye make-up, Dental products: Dentifrices, Oral rinses, Tooth powder, Tooth paste. Personal Hygiene Products: Shaving creams, after shave products.

.....
LABORATORY COURSE WORK BASED ON PAPER-XVII:

1. Preparation of selected cosmetic preparations representing the following classes:
 - i. Shampoos
 - ii. Hair conditioners
 - iii. Hair creams
 - iv. Skin creams
 - v. Nail polish
 - vi. Face powders
 - vii. Tooth pastes
 - viii. Tooth powder
 - ix. Shaving cream
 - x. After shave lotion
2. Evaluation of any two products mentioned above
3. Collection of various packaging materials used for cosmetics and their description (Each student shall collect at least 10 different types of containers.)



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

SEMESTER-IV

***THEORY PAPER-XVIII: DRUG STANDARDIZATION AND REGULATIONS (Elective)**

Periods: 60

Credits: 04

UNIT-I: STANDARDIZATION OF HERBAL MATERIAL (15 periods)

Standardization of herbal raw materials including Pharmacognostic, physical, chemical and biological methods with examples, Standardization of herbal extracts, physical, chemical and spectral analysis.

UNIT-II: EVALUATION OF HERBAL EXTRACTS (15 periods)

Qualitative and Quantitative estimation of active principles from standardized extracts by HPTLC, Biological standardization -Pharmacological screening of herbal extracts and Microbiological evaluation of herbal extracts Toxicity studies of herbal extracts.

UNIT-III: HERBAL DRUG PROCESSING PRACTICES (15 periods)

Good Agricultural Practices, Good practices in collection of plant materials, Primary processing of herbal products. Documentation required other guidelines for Quality Assurance of Herbal drugs.

UNIT-IV: DRUG REGULATION (15 periods)

Drug Regulatory Affairs: Role of Regulatory Affairs Dept, Nomenclature and salient features of regulatory authorities of India, US, Japan and EU, Stability testing protocols of drug products as per ICH guidelines.

LABORATORY COURSE WORK BASED ON PAPER-XVIII:

1. Preparation of monoherbal formulations and its evaluations.
2. Preparation of polyherbal formulations and its evaluations.
3. Formulation and standardization of some important herbal cosmetics.
4. Demonstration of various dosage forms available in each system.
5. Simple preparations used in Ayurvedic System and their Standardization (with special emphasis on HPTLC).
6. Simple preparations used in Siddha system and their Standardization (with special emphasis on HPTLC).
7. Simple preparations used in Unani system and their Standardization (with special emphasis on HPTLC).
8. Simple preparations used in Homeopathy system and their Standardization (with special emphasis on HPTLC).



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SEMESTER-IV

***THEORY PAPER-XIX: HERBAL DRUG ACTION (ELECTIVE)**

Periods: 60

Credits: 04

UNIT-I: HERBAL DRUGS AND ALLERGENS (15 periods)

Classification of medicinal plants based on their effects – Ecological status with special reference to India, common herbal drugs available in market and their composition, Drug industries in India with special reference to Maharashtra. Allergens – types – sources – active principles – Chemical nature – Cell modifiers – Lectins – mutagens, teratogens – Allergic reactions with known examples.

UNIT-II: TYPES OF DRUGS AND MECHANISM OF THEIR ACTION (15 periods)

Herbal drugs acting on brain and nervous system – Rheumatic arthritis – Psychoactive drugs – Depressants, Stimulants, hallucinogens – sources, effects, basic mechanism of action.

UNIT-III: COMMON DISEASES AND DRUG ACTION-I (15 periods)

Herbal drugs and Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary / respiratory disorders – asthma – bronchitis – common cold – allergy – Remedy from plants.

Unit-IV: COMMON DISEASES AND DRUG ACTION-II (15 periods)

Drugs for urinogenital disorders – roots of *Withania somnifera*– Memory stimulants – *Centella asiatica*– Drugs for dissolving kidney stones – *Musa paradisiaca* (pseudostem) – Antiinflammatory drugs – *Cardiospermum* – Anticancer drugs – *Catharanthus roseus*.

LABORATORY COURSE WORK BASED ON PAPER-XIX:

1. Detection of Toxic protein from *Abrus Aconitin* – from roots of *Aconitum*, Strychnine – from seeds of *strychnos*, Nicotin – from leaves of *Nicotiana*, Alkaloids – from members of *solanaceae*, Hydrocyanin – from plants
2. Study of common allergens and Allergy
3. Role of lectins
4. Anticancer drug from *Catharanthus roseus*
5. Depressants – opium (*Papaver somniferum*)
6. Stimulants – *Strychnos nux – vomica*, *Coffea arabica*
7. Blood pressure – *Digitalis purpurea*; *Ephedra*; *Atropa belladonna*; *Claviceps purpurea*
8. Diuretic properties.



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

SUGGESTED READINGS

THEORY PAPER-XI:

1. Textbook of Pharmacognosy by C.K.Kokate and D.P.Purohit (Nirali Prakashan, Pune)
2. Trease G.E. and Evans w.e., Pharmacognosy (Baillere Tindall, Eastbourne)
3. Tyler V.E., Brady L.R. and Robbers J.E., Pharmacognosy (Len & Febiger, Philadelphia)
4. Pharmacognosy by T.E. Wallis (CBS Publisher, New Delhi)
5. Staba E.J., Plant Tissue Culture as a source of Bio-medicinals

THEORY PAPER-XII:

1. Introduction to plant tissue culture by M.K. Razadam
2. Molecular biology & Biotechnology by J.M. Walker & E.D. Gingo
3. Advanced methods in plant breeding & biotechnology by David R Mirray
4. Experiments in plant tissue culture by John, H.D. & Lorin W.R.
5. Plant cell & tissue culture by Jafferey. W. Pollard & John. M. Walker
6. Breeding field crops by John M.P. & David. A.S.
7. Pharmaceuticals Biotiechnology S.P. Vyas & V.K. Dixit
8. Biotechnology theory & technique vol I by Jack. G. C.
9. Pharmacognosy by G.E. Trease & W.C.Evans ELBS.
10. Biotechnology by purohit & Matherr
11. Comprehensive biotechnology by Mooyoung
12. Biotechnology application to tissue culture by Shargool.
13. Plant tissue culture by Dixon
14. Plant tissue culture by Street
15. Elements of Biotechnology by P.K. Gupta.

THEORY PAPER-XIII:

1. Industrial Biotechnology: L E Casida
2. Industrial Biotechnology: B M Miller and W Litsky
3. Microbial Technology Vols j & II: H Pepler
4. Industrial Biotechnology: Vedpal S Malik and Padma Sridhar
5. Biochemistry of Industrial Microorganisms: C Rainbow and A H Rose
6. Animal Cell Culture: Ian Freshney
7. Microbial Genetics: David Freifelder
8. Biochemical Engineering Fundaments: Bailey and Ollis
9. Biotechnology of Antibiotics and Other Bioactive Microbial Metabolites: Giancarlo Lancini and Roland Lorenzetti
10. Bioreactor Design and Product Yield: Butterworth and Heinemann
11. Enzyme Assays - A Practical Approach: Robert Eisenthal and Michael J Danson
12. Fermentation and Biochemical Engineering Handbook: Henry C Vogel
13. E L V Harris and S. Angal, Protein Purification Methods, Ed. IRL Press at Oxford University Press, 1989.
14. P.A. Belter, E.L. Cussler and Wei-Shou Hu., Bioseparations-Downstream Processing for Biotechnology, Wiley-Interscience Publication, 1988.
15. J. E. Bailey and D. F. Ollis, Biochemical Engineering Fundamentals, 2nd Edition, Mc-Graw Hill, Inc., 1986.
16. R. K. Scopes, Berlin, Protein Purification: Principles and Practice, Springer, 1982.
17. Bernard Rosner, Fundamentals of Biostatistics, 5th Edition, Thomson Brooks/Cole, 2000.
18. Richard A. Johnson, Probability and Statistics for Engineers, 6th Edition, Prentice Hall, 2002.
19. Morris H. DeGroot, Mark J. Schervish, Probability and Statistics, 3rd Rev. Edition, Addison-Wesley, 2002.
20. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley, 2006.

THEORY PAPER-XIV:

1. Trease and Evan's Pharmacognosy 15th edition
2. Indian Herbal Pharmacopeia Vol-I and II
3. Quality Control methods for medicinal plant material by W.H.O., Geneva.
4. Quality Control of Herbal drugs by Dr. Pulak K. Mukherjee
5. Botanical safety hand book by Michael Meguffin, Christopher Hobbs published by American Herbal Product Association.
6. Herbal drugs by P.Mukherjee



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR

(w. e. f. June, 2015)

THEORY PAPER-XVI:

1. Quality control of herbal drugs by Pulok K Mukarjee, 1st edition, Business horizons Pharmaceutical publisher, New Delhi, 2002.
2. PDR for herbal medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
3. Indian Herbal Pharmacopoeia, Vol.1&2, RRL, 1DMA, 1998, 2000.
4. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae, 4th edition, Nirali Prakashan, 1996.
5. Text book of Pharmacognosy and Phytochemistry by rangare.
6. Plant drug analysis 2nd edition by Wagner, Bladt.

THEORY PAPER-XVII:

1. Cosmetics: Formulation, manufacturing, and Quality control by P.P.Sharma
2. A Handbook of Cosmetics by B.M. Mithal, R.N. Saha
3. The Theory and Practice of Industrial Pharmacy by Lachman L., Liberman, H.A.
4. Modern Cosmetics by Thomson, E.G.
5. Paucher's Perfumes, cosmetics & soaps by W.A.Paucher.
6. Hary's cosmeticology by J.B.Wilkimsson.
3. Herbal Cosmetics - H.Pande, Asia Pacific Business press, New Delhi.
4. H.Pande, "The complete technology book on herbal perfumes and cosmetics", National Institute of Industrial Research, Delhi.

THEORY PAPER-XVIII:

1. Ayurvedic Pharmacopoeia.
2. Ayurvedic Formulary of India, the Indian Medical Practitioners Co-operative Pharmacy and Stores Ltd, IMPCOPS.
3. Hand Book on Ayurvedic Medicines, H.Panda National Institute of Industrial Research, Delhi-7.
4. Ayurvedic system of medicine, 2nd edition, Kaviraj, Nagendranath Sengupata, vol. I & II.
5. Siddha Pharmacopoeia by Dr.S. Chidambarathanu pillai, 1st edition.
6. Unani Pharmacopoeia.
7. Homeopathic Pharmacopoeia.
8. Homeopathic Pharmacy An introduction & Hand book by Steven B. Kayne.
9. Alternative medicine, by Dr. K.B. Nangia.
10. Aromatherapy, Valerie Gennari Cooksley.
11. Indian Herbal Pharmacopoeia vol. I & II Indian Drug Manufacturer's association, Mumbai.
12. British Herbal Pharmacopoeia British Herbal Medicine Association, 1990 vol. I.
13. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Business horizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
14. Screening methods of Pharmacology by Robert turner.
15. Toxicology and Clinical Pharmacology of Herbal Products, Melanie Johns Cupp1. Herbal drug industry by R.D. Choudhary, 1st edition, eastern publisher, New Delhi: 1996.
16. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine Business horizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
17. Quality control of herbal drugs by Pulok K Mukarjee, 1st edition, Business horizons Pharmaceutical publisher, New Delhi, 2002.
18. PDR for herbal medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
19. Indian Herbal Pharmacopoeia, Vol.1&2, RRL, 1DMA, 1998, 2000.
20. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae, 4th edition, Nirali Prakashan, 1996.
21. Text book of Pharmacognosy and Phytochemistry by rangare.
22. Plant drug analysis 2nd edition by Wagner, Bladt.



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN
HERBAL MEDICINE- CURRICULUM
CLASS: M.Sc. SECOND YEAR
(w. e. f. June, 2015)

23. Biological standardization by J. N. Barn, D. J. Finley and L.G. Good win

THEORY PAPER-XIX:

- 1.Kumar, N.C. (1993). An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi.
- 2.Rao, A.P. (1999). Herbs that heal. Diamond Pocket Books (P) Ltd., New Delhi.
- 3.Screening methods of Pharmacology by Robert turner.
4. Toxicology and Clinical Pharmacology of Herbal Products, Melanie Johns Cupp1.
5. Herbal drug industry by R.D. Choudhary, 1st edition, eastern publisher, NewDelhi: 1996.



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ

नांदेड- ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED-431606, MAHARASHTRA STATE, INDIA.

स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड.

Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade



ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542

Website: www.srtmun.ac.in

E-mail: bos.srtmun@gmail.com

Fax : (02462) 229574

परिपत्रक

सर्व संबंधितांना या परिपत्रकान्वये कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या विज्ञान विद्याशाखेतर्गत M.Sc. Botany आणि M.Sc. Herbal Medicine द्वितीय वर्ष अभ्यासक्रमातील Laboratory Course मध्ये खालीलप्रमाणे दुरुस्ती करण्यात येवून शैक्षणिक वर्ष २०१५-१६ पासून लागू करण्यास मा. कुलगुरुंनी मा. विद्या परिषदेच्या वतिने मान्यता प्रदान करण्यात आली आहे.

Laboratory Course Work for M.Sc. Botany & M.Sc. Herbal Medicine Second Year (Annual Pattern)

Paper number & Title	Credits (Marks)			Practical's
	External: ESE	Internal: CA	Total Credits (Marks)	
Laboratory Course Work-V: Based on theory paper- XI & XII	Credit:03 (Marks:75)	Credit:01 (Marks:25)	Credit:04 (Marks:100)	15
Laboratory Course Work-VI: Based on theory paper-XVI & XVII	Credit:03 (Marks:75)	Credit:01 (Marks:25)	Credit:04 (Marks:100)	15
* Laboratory Course Work-VII: Based on theory paper- XIII, XIV, XVIII & XIX	Credit:03 (Marks:75)	Credit:01 (Marks:25)	Credit:04 (Marks:100)	15
* Laboratory Course Work-VIII: Project Work	Credit:03 (Marks:75)	Credit:01 (Marks:25)	Credit:04 (Marks:100)	15
Total	Credit:12 (Marks:300)	Credit:04 (Marks:100)	Credit:16 (Marks:400)	60

(ESE: End of Semester examination, CA: Continuous Assessment, *: Elective Paper)

तरी सदरील बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

“ज्ञानतीर्थ” परिसर

)

विष्णुपूरी, नांदेड.

)

जा.क्र.शैक्षणिक/०१/अभ्यासक्रम/

)

स्वा/—

/२०१५-२०१६/४४८०

)

संचालक

दिनांक : २९/०२/२०१६

)

महाविद्यालय व विद्यापीठ विकास मंडळ

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) प्राचार्य, सर्व संबंधित महाविद्यालये, प्रस्तुत विद्यापीठ.

२) परीक्षा नियंत्रक, प्रस्तुत विद्यापीठ.

३) कुलसचिव (निवडणूक व सभा कक्ष) यांचे कार्यालय, प्रस्तुत विद्यापीठ.

४) उपकुलसचिव, पदव्युत्तर विभाग व पात्रता विभाग, प्रस्तुत विद्यापीठ.