

**Competency-Based Dynamic Curriculum for MD/MS SIDDHA
(PRESCRIBED BY NCISM)**

தொட்டனைத் தூறும் மணற்கேணி மாந்தர்க்குக் கற்றனைத் தூறும் அறிவு

**Semester III-VI
Gunapadam Marunthiyal
(Materia Medica, Pharmacology and Pharmacognosy)
(SUBJECT CODE : SIDPG- GM)**

(Applicable from 2025-26 batch, from the academic year 2026-27 onwards until further notification by NCISM)



**BOARD OF UNANI, SIDDHA AND SOWA-RIGPA
NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE
NEW DELHI-110026**

PREFACE

Gunapadam Marunthiyal, a branch of Siddha Pharmacology, focuses on medicinal herbs, metals, minerals, salts, gems, and animal products. This field underpins drug development in Siddha medicine, addressing classifications based on taste, potency, and therapeutic uses. It aims to create an updated knowledge base for Siddha practitioners to treat ailments effectively and promote overall health. A key aspect is maintaining balance in the body's humors to achieve optimal health.

Pharmacognosy, the study of medicinal drugs from plants and natural resources, plays an important role in Marunthiyal. Medicinal plants are classified based on therapeutic actions, geological distribution, seasonal patterns, and disease associations, facilitating their use in formulations. It includes the identification, authentication, and preliminary phytochemistry of plants, which is essential for advancing plant-based studies. This knowledge helps postgraduate students address challenges in modern drug discovery, particularly with plant, mineral, and animal-derived products.

Purification of drugs has always been emphasized in Siddha medicine for better therapeutic outcomes, with indigenous methods developed for preparing medicines. Advancements in science have improved the quality of treatments, ensuring the broader benefits of Siddha medicine.

The Fauna in Gunapadam Marunthiyal offers insights into the properties and therapeutic uses of animals and animal products. Modern chemistry is integrated with ancient Siddha knowledge to uncover the chemical reactions involved in purification, calcination, oxidation, and alchemy. Siddhars were pioneers in the field of Alchemy which involves various minerals, metals, and herbs to create medicinal preparations considered elixirs that prolongs life. Recent advances in metallo-therapeutics and nanotechnology provide a deeper understanding of the chemical and instrumental analysis of metal-based drugs.

Marunthiyal equips students with essential pharmacological skills, exploring both theoretical and practical aspects. Students gain a comprehensive understanding of pharmacology, learning to design and conduct rigorous experimental studies to validate Siddha formulations. The guidelines of regulatory bodies namely GAP, GSP, GMP, GLP and GCP are adopted to maintain the quality standards of Siddha drugs. This interdisciplinary knowledge contributes to the scientific community through research and publications.

The field of Marunthiyal will create a base and provide specialized training for postgraduate students. It will also open new avenues for their careers and foster the development of drug standardization and novel drug research. This knowledge will enable students to explore other fields and further the benefits and applications of Siddha medicine. Ultimately, the goal is to create a scientifically validated Siddha system that will provide appropriate exposure and development for postgraduate students to become a responsible, academician, researcher, entrepreneur with practicing the skills.

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We want that education by
which character is formed,
strength of mind is increased,
the intellect is expanded, and by
which one can stand on one's
own feet.

-Swami Vivekananda

NCISM

(NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE)

Competency-Based Dynamic Curriculum MD/ MS SIDDHA

Gunapadam Marunthiyal (SIDPG- GM)

Summary & Credit Framework

Semester III-VI

Module Number & Name	Credits	Notional Learning Hours	Maximum Marks of assessment of modules (Formative Assessment)
Semester No : 3			
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)			
M1 Basics of Pharmacognosy	2	60	50
M2 Herbal Raw Materials	2	60	50
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbs including Phytopharmacology)			
M9 Mooligai Marunthariviyal (Phytopharmacology)	2	60	50
M10 Gunapadam Mooligai Iyal (Siddha Herbal Pharmacology)	2	60	50
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)			
M17 Essentials of inorganic chemistry and analytical chemistry	2	60	50
M18 Medical Mineralogy and Geology	2	60	50
Paper No : 4 (Essentials of Pharmacology)			
M25 General Pharmacology	2	60	50
M26 Drug Development Process	2	60	50
Total	16	480	400
Semester No : 4			
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)			
M3 Plant Anatomy and Powdered drug analysis	2	60	50
M4 Drug Authentication and Regulations	2	60	50

Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology)			
M11 Purification Methods of Herbal Raw drugs, Preparation of Higher-Order Medicines and Monographic Studies of Medicinal Plants	2	60	50
M12 Mooligai Maruthuva Payanpadugal (Therapeutic Applications of Medicinal Plants)	2	60	50
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)			
M19 Safety Pharmacology of Metals and Mineral Drugs	2	60	50
M20 Recent advances including applied pharmaceutics	2	60	50
Paper No : 4 (Essentials of Pharmacology)			
M27 Systemic Pharmacology and Screening methods of Central Nervous System(CNS), Respiratory and Renal Drugs	2	60	50
M28 Systemic Pharmacology and Screening methods of Autonomic Nervous System (ANS) and Cardiovascular System (CVS) Drugs	2	60	50
Total	16	480	400
Semester No : 5			
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)			
M5 Pharmacopoeial Standards of Herbal drugs	2	60	50
M6 Phytochemistry	2	60	50
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology)			
M13 Analytical standardization of herbal drugs	2	60	50
M14 Phytochemicals / Phytopharmaceuticals, Chromatographic techniques for isolation and Bioinformatics	2	60	50
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)			
M21 Ulogangal and Panchasootham (Metals and Mercurial Compounds)	2	60	50
M22 Paadanankal and Karasaram (Arsenic Compounds and Salts,Alkalies)	2	60	50
Paper No : 4 (Essentials of Pharmacology)			
M29 Systemic Pharmacology and Screening methods of Autacoids and Gastrointestinal Tract(GIT) Drugs	2	60	50
M30 Systemic Pharmacology and Screening methods of Drugs acting on Hormones and blood forming agents	2	60	50
Total	16	480	400
Semester No : 6			

Paper No : 1 (Medicinal Botany and Phytopharmacognosy)			
M7 Study of Herbal drugs based on therapeutic action for selective systems of the body	2	60	50
M8 Herbal Cosmetics	2	60	50
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology)			
M15 Herbs used in Siddha Dietetics	2	60	50
M16 Recent Trends in Plant Based Applications, Drugs and Cosmetics Act and Magic Remedies Act	2	60	50
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)			
M23 Uparasam and Navamanikal (Mineral substance and Gems) Jeeva Vaguppu – Part I (Drugs of Marine origin and Animal by products)	2	60	50
M24 Jeeva Vaguppu Part - II (Drugs of Marine Origin and Animal by Products)	2	60	50
Paper No : 4 (Essentials of Pharmacology)			
M31 Anti-microbials and Clinical Pharmacology	2	60	50
M32 Recent advances in Pharmacology	2	60	50
Total	16	480	400
Grand Total	64	1920	1600

Credit frame work

SIDPG- GM consists of 32 modules totaling 64 credits, which correspond to 1920 Notional Learning Hours. Each credit comprises 30 hours of learner engagement, distributed across teaching, practical, and experiential learning in the ratio of 1:2:3. Accordingly, one credit includes 5 hours of teaching, 10 hours of practical training, 13 hours of experiential learning, and 2 hours allocated for modular assessment, which carries 25 marks.

Important Note: The User Manual MD/MS Siddha is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note that the contents related to the MSE should be considered authentic. Each paper has 16 credits and each semester covers 16 credits across 4 papers. In case of difficulty and questions regarding the curriculum, write to syllabus24sid@ncismindia.org.

Credit Analysis Overview					
Sem/Paper	Paper No 1	Paper No 2	Paper No 3	Paper No 4	Credits
Semester 3	M-1 2 Crs M-2 2 Crs	M-9 2 Crs M-10 2 Crs	M-17 2 Crs M-18 2 Crs	M-25 2 Crs M-26 2 Crs	16
Semester 4	M-3 2 Crs M-4 2 Crs	M-11 2 Crs M-12 2 Crs	M-19 2 Crs M-20 2 Crs	M-27 2 Crs M-28 2 Crs	16

Semester 5	M-5 2 Crs M-6 2 Crs	M-13 2 Crs M-14 2 Crs	M-21 2 Crs M-22 2 Crs	M-29 2 Crs M-30 2 Crs	16
Semester 6	M-7 2 Crs M-8 2 Crs	M-15 2 Crs M-16 2 Crs	M-23 2 Crs M-24 2 Crs	M-31 2 Crs M-32 2 Crs	16
Credits	16	16	16	16	64

Semester VI University examination					
Theory			Practical*		
Paper	Marks	Total	Practical Heads	Marks	Total
Paper -1	100	400	Long case or procedure/Major practical as applicable	100	400
			Short case or procedure/Minor practical	50	
Paper -2	100		Spotters	50	
			Assessing teaching ability	25	
Paper -3	100		Assessing presentation skills	25	
			# Viva (4 examiners: 25 marks/each examiner)	100	
Paper -4	100		Logbook (Activity record)	25	
			Practical/Clinical Record	25	
Semester VI University examination – 800 Marks					

* Details in 6H table, #No separate marks for dissertation viva.

Course Code and Name of Course

Course code	Name of Course
SIDPG-GM	Gunapadam Marunthiyal (Materia Medica, Pharmacology and Pharmacognosy)

Table 1 : Course learning outcomes and mapped Program learning outcomes

CO No	A1 Course learning Outcomes (CO) SIDPG- GM At the end of the course SIDPG- GM, the students should be able to-	B1 Course learning Outcomes mapped with program learning outcomes.
CO1	Demonstrate and appreciate the authoritative understanding of Siddha fundamental principles like Suvai, Veerium and Pirivu in Siddha Marunthiyal.	PO1,PO2,PO3,PO6
CO2	Perform Authentication, Purification of Raw drugs of Herbal, Metal, Mineral and animal origin used in traditional medicines and develop skills in identifying the adulterants.	PO3,PO4,PO5
CO3	Assess and evaluate Quality standards of Siddha Raw drugs of herbal, metal, mineral and animal origin and describe key framework of regulatory bodies adopting GAP, GSP, GMP, GLP and GCP.	PO4,PO5
CO4	Integrate Principles of Chemistry, Pharmacology, Toxicology with Marunthiyal in New Drug Development and demonstrate proficiency in Fundamentals of Analytical Chemistry and Analytical Instrumentation and Interpret them in the characterization of raw drugs	PO4,PO5
CO5	Analyze and apply emerging fields of Pharmacology such as Pharmacogenomics and Nano pharmacology in Siddha system of Medicine in the understanding of Individual Variability, disease susceptibility and treatment responses to Siddha Formulations.	PO4,PO5
CO6	Demonstrate the socio-economic importance of Herbal, Metals, minerals, and animal drugs with special reference to trade, cosmetology, and nutraceuticals.	PO7
CO7	Design, develop and carry out high quality research in standardization and exploration of nanoscience in Siddha Marunthiyal	PO4
CO8	Acquire skills to become a socially responsible clinician, teacher, researcher, entrepreneur by practicing the skills learnt and ethical practices for selection of raw materials and their rationale use.	PO2,PO3,PO6

Table 2 : Course contents (Modules- Credits and Notional Learning Hours)

Paper No : 1 (Medicinal Botany and Phytopharmacognosy)						
Semester No : 3						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
1	M-1 Basics of Pharmacognosy Inculcates knowledge of importance of Medicinal Botany, Pharmacognosy Ethnobotany, Ethnopharmacology and various Traditional Medicines including Indian Systems of Medicine which paves the way for drug discovery from Medicinal Plants in a sustainable manner. • M1U1 Introduction 1.1.1 Introduction to Medicinal Botany and Phytopharmacognosy. 1.1.2 History of Pharmacognosy and Medicinal Botany 1.1.3 Application of Medicinal Botany in Traditional Indian Medicines (TIM) • M1U2 Traditional Medicines	2	10	20	30	60

1.2.1 Traditional and complimentary Medicines around the Globe 1.2.2 Indian System of Medicines– Siddha, Ayurveda, Unani and Sowa-Rigpa 1.2.3 WHO status of Traditional Medicine • M1U3 Ethno-Botany 1.3.1 History of Ethnobotany. 1.3.2 Ethnic tribes of India and their Medicines with special reference to Tamilnadu, Kerala, Karnataka and Andhra Pradesh 1.3.3 Geographical location of Important Indian Medicinal plants 1.3.4 Methods in Ethnobotany. Ethnomedicinal plants of different communities. • M1U4 Ethnopharmacology 1.4.1 Ethnopharmacology as a source for drug development. 1.4.2 Screening techniques for Herbal Lead Compound. 1.4.3 Drugs derived through Ethnopharmacology • M1U5 Conservation of Medicinal plants 1.5.1 Conventional Propagation Methods for Medicinal Plants.					
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	1.5.2 Biodiversity conservation of Medicinal Plants					
	1.5.3 Sacred Groves and their importance in conservation of Medicinal plants					
2	M-2 Herbal Raw Materials Provides knowledge of organized Herbal drugs with Trade names, Commerce, Geographical Indications, BIS grading with their pharmacognostical aspects. • M2U1 Root, Rhizome, Stem, Wood and Bark drugs 2.1.1 Pharmacognostical aspects (Morphology, Organoleptic and Anatomical characters) of medicinally useful Roots, Rhizomes, Stem, Wood and bark drugs • M2U2 Leaf, Flower, Fruit and Seed Drugs 2.2.1 Pharmacognostical aspects (Morphology, Organoleptic and Anatomical Characters) of medicinally useful Leaf, Flower, Fruit and Seed • M2U3 Herbal Market and Geographical Indication (GI) of herbal drugs 2.3.1 Overview of National and International Herbal Trade: Origins, Sources, Seasonal Availability, Trade Names, and Geographical Indication GI-Tagged Herbal Drugs and Spices • M2U4 Bureau of Indian Standards (BIS) for Herbal drugs 2.4.1 Bureau of Indian Standards Regulations 2.4.2 Bureau of Indian Standards(BIS) Grading of Herbal drugs and Spices	2	10	20	30	60

	2.4.3 International grading for Herbal drugs • M2U5 Trade and Commerce in Herbal drugs 2.5.1 Export-import rules, procedures and details for herbal drugs. 2.5.2 Drug procurement, storage, pest control in storage, packaging and trading methods. 2.5.3 Online trading and e-channels for herbal drugs. 2.5.4 Herbal Drug/plant quarantine certificate procedure.					
		4	20	40	60	120
Semester No : 4						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
3	M-3 Plant Anatomy and Powdered drug analysis	2	10	20	30	60

Plant Anatomy is very important in Herbal pharmacognosy as Authenticity of herbal drugs is established by Plant Anatomy by comparing the characters anatomically to solve taxonomical problems and for the explanation of Phylogenetic relationship.

• M3U1 Microscopy

3.1.1 Different types of Microscopes and associated apparatus for measurements

3.1.2 Techniques in Microscopy

• M3U2 Plant Histology

3.2.1 Cell differentiation in Plants –Epidermal trichomes, Cork tissue, Sclereids, Fibre, Xylem and Phloem.

3.2.2 Ergastic cell contents –Starch, Protein, Crystals and secretory products

• M3U3 Microscopical Sectioning

3.3.1 Techniques in Sectioning of Plant drugs.

3.3.2 Techniques and procedure in preparing permanent slide

3.3.3 Preparation of permanent slides for future study.

• M3U4 Anatomical Analysis of Herbal drugs

	3.4.1 Anatomical analysis of various herbal drugs mentioned in the Siddha Monographs. 3.4.2 Comparative analysis of herbal drugs having related species. • M3U5 Powdered Drug Analysis 3.5.1 General use of Reagents for Powder Microscopical Analysis. 3.5.2 Powdered drug Analysis of Siddha Medicinal Plant materials and their methods					
4	M-4 Drug Authentication and Regulations Herbal drug Authentication is important because it ensures the safety and efficacy of herbal medicines. It verifies the correct Plant species and parts which are used as raw materials. Authentication methods help to identify and minimize the risk of adulteration and falsification. • M4U1 Adulteration and Substitution 4.1.1 Study of various adulterants in genuine drugs and their comparative evaluation. 4.1.2 Substitution of Herbal drugs in Siddha medicine. • M4U2 Plant Identification 4.2.1 Methods in plant identification – Morphological and Anatomical description,	2	10	20	30	60

4.2.2 Chemotaxonomy					
4.2.3 Molecular taxonomy					
4.2.4 DNA finger printing of medicinal plants					
• M4U3 Medicinal plant databases					
4.3.1 Explore the Biodiversity portal, World Flora Online					
4.3.2 Plants of the World Online by Royal Botanical Garden.					
4.3.3 International Plant Name Index (IPNI)					
4.3.4 Indian Medicinal Plants, Phytochemistry and Therapeutics (IMPPAT)					
4.3.5 Natural Products ALERT (NAPRALERT)					
• M4U4 Authentication with Herbaria and Floras					
4.4.1 Plant drug Authentication with reference to Botanical Survey of India, local and Regional Herbaria and Floras.					
• M4U5 Herbal Drug Regulations					
4.5.1 Herbal drug regulations in India – AYUSH guidelines.					
4.5.2 International Herbal drug regulations.					
4.5.3 Exploration of Indian Pharmacopoeias and Monographs on Indian Medicinal Plants					
	4	20	40	60	120
Semester No : 5					

2A Module Number	2B Modules & units	2C Number of Credits	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
5	M-5 Pharmacopoeial Standards of Herbal drugs To achieve safety and efficacy of Herbal drugs through Pharmacognostical evaluations, Drug Regulations and Quality Assurance methods. • M5U1 Structural Standards 5.1.1 Origin of herbal drugs and Geographical source 5.1.2 Biological source 5.1.3 Structural parameters (Visible and Microscopical) • M5U2 Analytical Standards 5.2.1 Phytochemical analysis - Fluorescent method 5.2.2 Histological analysis.	2	10	20	30	60

	5.2.3 Phytochemical variations and chemical races in medicinal plant species • M5U3 Quality Assurance of Herbal drugs 5.3.1 Methods of determination of purity of herbal drugs and herbal preparations. 5.3.2 Parameters of Quality control 5.3.3 Quality Assurance of Herbal drugs • M5U4 WHO guidelines for various contaminants in herbal drugs 5.4.1 Limit tests for pesticide residues, Heavy metals, Radioactive contamination and Microbial contaminations. • M5U5 Botanical Standards 5.5.1 Botanical Reference Standards (BRS) in authentication of medicinal plant species 5.5.2 Botanical Reference Standards and Biomarkers in Medicinal plants. 5.5.3 Application of BRS in plant drug standardisation and chemical profiles					
6	M-6 Phytochemistry The action of the Herbal drugs depends on their Lead chemical constituents. Detection of secondary metabolites and their functional groups serve as a biomarker in drug identification and in efficacy studies • M6U1 Alkaloids 6.1.1 Alkaloids – Definition, occurrence, classification, medicinal importance and detection. 6.1.2 Functional group analysis in alkaloidal drugs using Fourier Transform Infrared	2	10	20	30	60

spectroscopy (FTIR) and ultraviolet (UV) visible spectroscopy. • M6U2 Glycosides 6.2.1 Glycosides – Definition, occurrence, classification, medicinal importance and detection. 6.2.2 Functional group analysis in Glycosidal drugs using FTIR and UV visible Spectroscopy. • M6U3 Tannins 6.3.1 Tannins – Definition, occurrence, classification, medicinally important tannins and detection. 6.3.2 Functional group analysis in Tannin containing drugs using FTIR and UV visible Spectroscopy. • M6U4 Flavonoids 6.4.1 Flavonoids – Definition, occurrence, important flavonoids and detection. 6.4.2 Functional group analysis using FTIR and UV visible Spectroscopy • M6U5 Phytosterols 6.5.1 Phytosterols – Definition, occurrence, classification, medicinal phytosterols and detection. 6.5.2 Functional group analysis of plant sterol drugs using FTIR and UV visible Spectroscopy.						
		4	20	40	60	120

Semester No : 6

2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total

7	M-7 Study of Herbal drugs based on therapeutic action for selective systems of the body It gives a vast knowledge of the clinical classification of medicinal plants, their therapeutic potential pertaining to various systems of the body • M7U1 Rejuvenating herbs 7.1.1 Adaptogens, Immunomodulators, Rejuvenating and Aphrodisiac Medicinal plants. 7.1.2 Memory enhancing and Nervine tonic plants 7.1.3 Hepatoprotective medicinal plants 7.1.4 Medicinal plants used in the treatment of Geriatric diseases like Arthritis, Alzheimer's, Parkinson's disease, etc with responsible chemical constituents. • M7U2 Herbal drugs acting on Gastrointestinal tract and Endocrine system 7.2.1 Medicinal plants used in Diabetes mellitus. 7.2.2 Medicinal plants used in the treatment of Obesity. 7.2.3 Medicinal plants in the treatment of gastric ulcers and piles with responsible chemical constituents • M7U3 Herbal drugs acting on Respiratory system 7.3.1 Medicinal plants used in the treatment of Asthma, Tuberculosis, Sinusitis, Allergic rhinitis with responsible chemical constituents.	2	10	20	30	60
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	• M7U4 Anti-Cancer and Anti-microbial herbal drugs 7.4.1 Medicinal plants used in various Cancers. 7.4.2 Anti-viral medicinal plants. 7.4.3 Herbs to treat bacterial infections 7.4.4 Herbs to treat fungal infections with respective therapeutic chemical constituents • M7U5 Poisonous and Narcotic plant drugs 7.5.1 Narcotic Plants and their legal status 7.5.2 Poisonous plants and antidote plants 7.5.3 Medical Cannabis around the world.					
8	M-8 Herbal Cosmetics It is a highly evolving potential field with great scope in the world of herbal market. Herbal Cosmetic products are highly preferred due to their less or no side effects compared to synthetic cosmetic products. This module provides ample details of herbal cosmetic drug development and their regulations.	2	10	20	30	60

• **M8U1 Introduction**

8.1.1 Herbal cosmetics in Siddha system.

8.1.2 Traditional and Folklore herbal cosmetics.

8.1.3 Plants commonly used in herbal cosmetics.

• **M8U2 Herbal Hair tonics**

8.2.1 Hair growth Promotor plants

8.2.2 Dye yielding plants

8.2.3 Hair colouring and bleaching herbs

8.2.4 Anti-dandruff plants and formulations

8.2.5 Anti-hair fall herbs their chemical constituents, properties and action.

• **M8U3 Herbs for Face and Skin**

8.3.1 Oils used in facial cosmetics 8.3.2 Herbal cleansers. 8.3.3 Herbal facial cream.

8.3.4 Herbal mouth wash. 8.3.5 Herbal oral creams 8.3.6 Herbal anti-wrinkle creams and skin toners with chemical properties, and action.

• **M8U4 Product Development of Herbal Cosmetics**

8.4.1 Use of Herbal additives, emulsifiers, preservatives, colour, fragrance, excipients, stabilising agents etc.					
8.4.2 Methods of preparation of					
8.4.2.1 Herbal creams					
8.4.2.2 Herbal gels					
8.4.2.3 Herbal hair oil					
8.4.2.4 Herbal face pack					
8.4.2.5 Herbal lipstick					
8.4.2.6 Herbal shampoo					
8.4.2.7 Herbal lotion					
8.4.2.8 Herbal Gummies for hair, nail and skin.					
8.4.3 Packing, labeling and marketing methods of cosmetic products.					

	• M8U5 Regulation in Herbal Cosmetics 8.5.1 Compliance of Drug and Cosmetics Act.1940. 8.5.2 Bureau of Indian Standards (BIS) guidelines for Cosmetic Products 8.5.3 International regulations for Herbal cosmetics 8.5.4 Toxicity assays for herbal cosmetics.					
		4	20	40	60	120
		16	80	160	240	480
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology)						
Semester No : 3						
2A Module Number	2B Modules & units	2C Number of Credits	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
9	M-9 Mooligai Marunthariviyal (Phytopharmacology)	2	10	20	30	60

This module deals with applying Siddha fundamental Principles and therapeutics of *kayakarpam*, Properties of *Kayakarpa Mooligaikal* (rejuvenating plants), Special herbs based on their colour, *Veru peyarkalin peyar karanangal* (reasons for nomenclature), medicinal plants with special properties, *Thogai sarakkugal* (Classified Group of raw drugs/ herbs), *Mooligai vaippu sarakku* (prepared substitutes for natural substances by synthetic method), *Mooligai uppu and Satthu*

• **M9U1 Kayakarpa Mooligaikal (Rejuvenating plants)**

9.1.1. *Kayakarpa Mooligaikal* (Rejuvenating plants)

9.1.1.1. Siddha Fundamental principles and therapeutic usage of *MooligaiKarpam*

9.1.1.2. Method of Preparation, administration, dosage and adjuvant of *Mooligaikarpam*

9.1.1.3. Rules and Regulations to be followed while taking *Karpam*

9.1.1.4. Pathiyam for *Kaya Karpam* (Diet Regimen)

9.1.1.5. Types - *Pothu Karpa Mooligaikal*, *Sirappu Karpa Mooligaikal*

9.1.1.6. *Thani Mooligai Karpam*

9.1.1.7. *Kootu Mooligai Karpam*

9.1.1.8. List of *Mooligaikal* used as *Karpam* from *Theraiyar Yamaga Venba & Gunapadam Mooligai Vaguppu*:

1. Amukkara 2. Azhinjil 3. Aayilpattai 4. Aalampal 5. Aal 6. Inji 7. Uthamani 8. Urulaikizhangu 9. Erukku 10. Elumitcham pazham 11. Elam 12. Orithazhthamarai

13.Kanja 14.Kachchur 15. Kadukkai 16. Kaliyanapoosani 17. Kalippirandai 18. Katrazhai 19.Kaalaan 20.Kittikizhangu 21. Keezhanelli. 22. Kuppaimeni 23. Koraikizhangu 24.Seedevi Sengazhuneer 25. Sirukeerai 26. Seeragam 27. Surai 28. Serankottai 29. Thamarai 30. Thippilli 31.Thulasi 32.Thuthuvelai 33.Thetran 34.Nannari 35.Naanal 36.Nelli 37.Brahmathandu 38.Panai 39.Puliyarai 40.Ponnankanni 41.Manatthakkali 42.Mookkirattai 43.Vasalai 44.Vallarai 45.Vallaikodi 46.Vaatkorai 47. Vila 48.Vennotchi 49.Vembu 50. Malatukku Karpam 51.Pillai peramatamal varunthuvorukku Karpam 52.Tharutya Karpam (Some important Karpa Mooligaikal found in Konganavar Karpam, PulipaniKarpam, Bogar Karpam and other Siddha classical texts)

1. Aththi 2. Avuri 3. Azhukanni 4. Iraththakalli 5. Ilanthai 6. Udhiravengai 7. Etti 8.Ellu 9. Kandangathiri 10.Karanthai 11. Karuvel 12. Kavizhthumbai 13. Kodiveli 14. Sivanarvembu 15.Seenthil 16.Nilakadambu 17. Nilavagai 18. Nerunjil 19. Brahmi 20. Pulluruvi 21. Manjal 22.Marutham 23. Valampurikkai 24.Vidather 25.Vishnukranti etc

9.1.2. Karpa Mooligaikal based on its colour

9.1.2.1. Unique properties of Karupu (Black), Sivappu (Red), Pon niram (yellow) & Venmai nira mooligai (white varieties) and their actions

9.1.2.2. Siddha Special techniques used to enrich the soil for the cultivation of black herbs

9.1.2.3. Immunomodulatory, antioxidant and anti-inflammatory effects of black and other special coloured herbs

• **M9U2 Mooligaikalin Veru Peyargalum Peyarkaranamum (Synonyms and their meanings)**

9.2.1. Veru peyargalum athan mukkiyathuvamum (Importance of nomenclature)

9.2.2. Vernacular names

9.2.3. Homonyms, Synonyms of various herbs

9.2.4. Synonyms and their meanings

1.Agathi 2. Agil 3. Ashogu 4. Athimadhuram 5. Athividayam 6. Atthi 7. Antarathamalai 8. Anthimalli 9. Abini 10. Amukkara 11. Ammanpacharisi 12. Arasu 13. Arathai 14. Alari 15. Alli 16. Avarai 17. Avuri 18. Arugampul 19. Adathodai 20. Adutheendappalai 21. Aamanaku 22. Alamaram 23. Aavarai 24. Ithii 25. Iluppai 26.

Echuramooli 27. Ulundhu 28. Oomathai 29. Etti 30. Erukku 31. Elumichai 32. Ellu 33. Kanja 34. Kadugu 35. Kadukkai 36. Kandangathari 37. Karisalai 38. Karunjeeragam 39. Karumbu 40. Kazharchi 41. Kunkuma poo 42. Kuppaimeni 43. Kumari 44. Kodiveli 45. Kotthumalli 46. Kondrai 47. Gothumai 48. Koraikizhangu 49. Chathurakalli 50. Santhanam 51. Sivakaranthai 52. Sitramutti 53. Seenthil 54. Seerakam 55. Chukku 56. Chundai 57. Chenbagam 58. Thaneervitan 59. Thamarai 60. Thippili 61. Thillai 62. Thumbai 63. Thulasi 64. Thuthuvalai 65. Thennaimaram 66. Thettran 67. Thottalvadi 68. Nancharuppan 69. Natthaisoori 70. Nannari 71. Nayuruvi 72. Naval 73. Nilappanai 74. Nilavembu 75. Neermulli 76. Nerunchil 77. Nelli 78. Notchi 79. Parangipattai 80. Panai 81. Pirandai 82. Brahmi 83. Puli 84. Puliয়ারai 85. Ponnankanni 86. Manjal 87. Maruthamaram 88. Milagarana 89. Milagu 90. Murungai 91. Vallarai 92. Vaividangam 93. Vaazhai 94. Vilvam 95. Vengayam 96. Vellulli 97. Vettrilai 98. Vembu 99. Veliparuthi 100. Velai,etc,..

• **M9U3 Herbs with Unique Properties**

9.3.1. Medicinal plants mentioned in Ancient Tamil Literatures related with Siddha Gunapadam

9.3.2. Medicinal plants growing in *Ainthinai* (Five Landscapes) related with Siddha Gunapadam

9.3.3. Plants used in Rituals and Holistic activities

9.3.4. Plants used as Antidote for poisonous bites and poisonous material intake

9.3.5. *Atta Karma Mooligaikal*

9.3.6. Medicinal Benefits of *Nooru Varuda Palamaiyana Marangal*

9.3.7. Medicinal Benefits of the *Vadaver*

• **M9U4 Thogai Sarakkugal (Classified Group of raw drugs/ herbs)**

9.4.1. *Thogai sarakkugal*

9.4.1.1. Reasons for grouping and relationship

9.4.1.2. Specific formulations

9.4.1.3. Siddha aspect on the basis of *Suvai, Thanmai, Pirivu* in *Uyir thathukal* and *Udal thathukal* of *Thogai sarakkugal* & Synergistic effect of grouped drugs

9.4.1.4. Organoleptic characters.

9.4.2. Types-Based on Numerical classification

9.4.2.1. *Iru sarakugal* (Group of two)

1. *Iru agathi* 2. *Iru pirandai* 3. *Iru manjal* 4. *Iru nannari* 5. *Iru thuthi* 6. *Iru nerunji*
7. *Iru palai* 8. *Iru pagal* 9. *Iru poola* 10. *Iru seeragam*

9.4.2.2. *Moontro sarakkugal* (Group of Three):

1. *Thirikadugu /Thirikadugam* 2. *Thirikandagam* 3. *Thirikandagi* 4. *Thirikaarasikam*
5. *Thirikaayam* 6. *Thirikirutham* 7. *Thirikumari* 8. *Thirikobam* 9. *Thirisadham* 10.
Thirisaathi 11. *Thirisaathagam* 12. *Thirisaathigam* 13. *Thirisugantham* 14.
Thirinerunjil 15. *Thirininbam* 16. *Thiripadu* 17. *Thiripaththiri* 18. *Thiripalai* 19.
Thiriparaagam 20. *Thiripazham (Mukkani)* 21. *Thirimanjal* 22. *Thirimadhuram* 23.
Thirimoolam 24. *Thirilavangam* 25. *Thirilavangapoo* 26. *Thirimatham* 27. *Thirumal*
28. *Moondru kuruththu* 29. *Moondru mutti*.

9.4.2.3. *Nanku sarakkugal* (Group of Four):

1. *Kadu sadhursadham* 2. *Kulavintham* 3. *Sathutchakam* 4. *Sathuramilam* 5.
Sathuramlam 6. *Sadhursadham* 7. *Sathushanam* 8. *Sathurpaththirakam* 9. *Naalennei*
10. *Naalelam* 11. *Naarpalmaram* 12. *Parimalavarkkam* 13. *Paathirikoottam* 14.
Moolasadhurvarkkam

9.4.2.4. *Ainthu sarakkugal* (Group of Five):

1. *Ainkaayam* 2. *Ainkolam / Panja kolam* 3. *Aindhu saathi* 4. *Ainthuvar* 5.
Ainndhennai 6. *Aimparuththi* 7. *Aimpunnai* 8. *Aimpurasu* 9. *Aimmaadhulai* 10.
Aimmoolam / Panjamoolam 11. *Ainthu vitha kasappu/ kaippainthu* 12. *Ainthu vellari*
13. *Ainthu vendai* 14. *Ainthu vetrilai* 15. *Ainthu vembu* 16. *Thiranapanjamoolam* 17.
Panjakkini-moolam 18. *Panja karpam* 19. *Panja kamam* 20. *Panja kaarakam* 21.

Panja sarkkarai 22. Panja saadham 23. Panja thiraviyam 24. Panja deepakkini 25. Panja thoobam 26. Panja pathiram 27. Panja palothakam 28. Panja panapoo 29. Panjamoolik kashayam 30. Panjalokatchayam 31. Panjavarkkam 32. Panjavaasam 33. Panjavilvam 34. Mahapanjamoolam 35. Lagupanjamoolam

9.4.2.5. *Aaru sarakkugal* (Group of Six):

1. *Aaru arisigal /Aaruvagai arisi* 2. *Aruvagai sarakku* 3. *Satsadham* 4. *Vadamerku aaru*

9.4.2.6. *Ezhuvakai sarakkugal* (Compounds of Seven):

1. *Sarvasaara mooligai* 2. *Saththa varukkam*

9.4.2.7. *Envakai sarakkugal* (Group of Eight):

1. *Atta kantham* 2. *Attakaayam* 3. *Atta santhanam* 4. *Atta chooranam* 5. *Atta dhurkkai mooli* 6. *Atta banthanam* 8. *Atta pushpam* 9. *Atta moolam* 10. *Attavakai* 11. *Attavarkkam* 12. *Atta virutcham*

9.4.2.8. *Onpathu sarakkugal* (Group of Nine):

1. *Navadhaniyam* 2. *Navagraha pushpam*

9.4.2.9. *Patthu sarakkugal* (Group of Ten):

1. *Elathy manjagam* 2. *Umayanagamalar* 3. *Ubayaver* 4. *Dhasamoolam* 5. *Paththu moolikai* 6. *Mahaadasamooli*

9.4.2.10. *Pathinettu sarakkugal* (Group of Eighteen):

1. *Attadasamoolam* 2. *Pathinen moolam*

	• M9U5 Vaippu Sarakku Muraigal (prepared substitutes for natural substance by synthetic method) and Mooligai Uppu Seimuraigal (Salts derived from the ashes of the medicinal plants) 9.5.1. <i>Vaippu Sarakku Muraigal</i> 9.5.1.1. <i>Abini Vaippu</i> 9.5.1.2. <i>Kaichukatti Vaippu</i> 9.5.1.3. <i>Kungumapoo Vaippu</i> 9.5.1.4. <i>Sampirani Vaippu</i> 9.5.1.5. <i>Perungaya Vaippu</i> 9.5.2. <i>Mooligai Uppu and Satthu Seimuraigal</i>					
10	M-10 Gunapadam Mooligai Iyal (Siddha Herbal Pharmacology) This module helps to explore botanical names, vernacular names, <i>suvai</i> (taste), <i>thanmai</i> (character), <i>veeriyam</i> (potency), <i>pirivu</i> (division), <i>Seigaigal</i> (actions), <i>Pothugunam</i> (general characters), medicinal uses, phytoconstituents, Wild medicinal plants and important plants of global origin • M10U1 Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Herbs 10.1. SIRU SEDIGAL (HERBS) 1. <i>Akkarakkaram – Anacyclus pyrethrum DC.</i> 2.	2	10	20	30	60

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| | <i>Athimathuram – Glycyrrhiza glabra L.</i> | | | | | | |
| 3. | <i>Athividayam – Aconitum heterophyllum Wall. ex Royle</i> | | | | | | |
| 4. | <i>Abini & Kasakasaa – Papaver somniferum L.</i> | | | | | | |
| 5. | <i>Ammaan Patcharisi – Euphorbia hirta L.</i> | | | | | | |
| 6. | <i>Araththai – Alpinia galanga Willd.</i> | | | | | | |
| 7. | <i>Alisivithai – Linum usitatissimum L.</i> | | | | | | |
| 8. | <i>Avuri – Indigofera tinctoria L.</i> | | | | | | |
| 9. | <i>Arukampul – Cynodon dactylon (L.) Pers.</i> | | | | | | |
| 10. | <i>Aadutheendapalai – Aristolochia bracteolata Lam.</i> | | | | | | |
| 11. | <i>Isappukolvidhai – Plantago ovata Forssk.</i> | | | | | | |
| 12. | <i>Inji – Zingiber officinale Roscoe</i> | | | | | | |
| 13. | <i>Impooral – Hedyotis umbellata L.</i> | | | | | | |
| 14. | <i>Rudra Jadai – Ocimum basilicum L.</i> | | | | | | |
| 15. | <i>Uzhundu – Vigna mungo (L.) Hepper</i> | | | | | | |
| 16. | <i>Oomathai – Datura metel L.</i> | | | | | | |
| 17. | <i>Ellu – Sesamum indicum L.</i> | | | | | | |
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| | <i>Elam – Elettaria cardamomum (L.) Maton</i> | | | | |
| 19. | <i>Omam – Carum copticum Benth.& Hook.f.; Kurosani Omam – Hyoscyamus niger L.</i> | | | | |
| 20. | <i>Orithazhtamarai – Hybanthus enneaspermus (L.) F.Muell.</i> | | | | |
| 21. | <i>Orilai Tamarai – Nervilia aragoana Gaudich.</i> | | | | |
| 22. | <i>Kanja – Cannabis sativa L.</i> | | | | |
| 23. | <i>Kadalai – Cicer arietinum L.</i> | | | | |
| 24. | <i>Kadugu – Brassica juncea (L.) Czern.</i> | | | | |
| 25. | <i>Kadugurokani – Picrorhiza scrophulariiflora Pennell</i> | | | | |
| 26. | <i>Kandangatthiri – Solanum surattense Burm.f.</i> | | | | |
| 27. | <i>Kanduparangi – Clerodendrum serratum (L.) Moon</i> | | | | |
| 28. | <i>Karanthai – Sphaeranthus indicus L.</i> | | | | |
| 29. | <i>Karisalankanni – Eclipta prostrata (L.) L.</i> | | | | |
| 30. | <i>Karpooravalli – Anisochilus carnosus (L.f.) Wall. ex Benth.</i> | | | | |
| 31. | <i>Karumbu – Saccharum officinarum L.</i> | | | | |
| 32. | <i>Karunaithandu – Amorphophallus paeoniifolius (Dennst.) Nicolson</i> | | | | |
| 33. | <i>Kala – Carissa carandas L.</i> | | | | |

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| 34. | <i>Kattrazhai – Aloe barbadensis Mill.; Kariyabolam – Aloe littoralis Baker</i> | | | | |
| 35. | <i>Kanchori – Tragia involucrata L.</i> | | | | |
| 36. | <i>Kattathi – Bauhinia tomentosa L.</i> | | | | |
| 37. | <i>Karai – Catunaregam spinosa (Thunb.) Tirveng.</i> | | | | |
| 38. | <i>Karbokarisi – Psoralea corylifolia L.</i> | | | | |
| 39. | <i>Kitchilikizhangu – Curcuma zedoaria (Christm.) Roscoe</i> | | | | |
| 40. | <i>Keeraikal –Aarai – Marsilea quadrifolia L.; Puliaarai – Oxalis corniculata L.; Manali – Gisekia pharnaceoides L.; Puthina – Mentha arvensis L.</i> | | | | |
| 41. | <i>Keezhanelli – Phyllanthus amarus Schumach. & Thonn.; Senkeezhanelli – Phyllanthus urinaria L.</i> | | | | |
| 42. | <i>Kungumapoo – Crocus sativus L.</i> | | | | |
| 43. | <i>Kudiyottipoondur – Argemone mexicana L.</i> | | | | |
| 44. | <i>Kuppaimeni – Acalypha indica L.</i> | | | | |
| 45. | <i>Kuruver – Vetiveria zizanioides (L.) Nash</i> | | | | |
| 46. | <i>Kodiveli and its types – Plumbago indica L.</i> | | | | |
| 47. | <i>Kothumalli – Coriandrum sativum L.</i> | | | | |
| 48. | <i>Kottam – Costus speciosus (Koen.) Sm.</i> | | | | |

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| 49. | <i>Korai – Cyperus rotundus L.</i> | | | | | | | | |
| 50. | <i>Jadamanji – Nardostachys grandiflora DC.</i> | | | | | | | | |
| 51. | <i>Sathakuppai – Anethum graveolens L.</i> | | | | | | | | |
| 52. | <i>Charanai – Trianthema decandra L.</i> | | | | | | | | |
| 53. | <i>Sivathai – Operculina turpethum (L.) Silva Manso</i> | | | | | | | | |
| 54. | <i>Sivanar Vembu – Indigofera aspalathoides Vahl ex DC.</i> | | | | | | | | |
| 55. | <i>Chitramutti – Pavonia zeylanica Cav.</i> | | | | | | | | |
| 56. | <i>Seeragam – Cuminum cyminum L.</i> | | | | | | | | |
| 57. | <i>Sukku – Zingiber officinale Roscoe</i> | | | | | | | | |
| 58. | <i>Cheruppadaï – Mollugo lotoides Linn.</i> | | | | | | | | |
| 59. | <i>Thamarai – Nelumbo nucifera Gaertn.</i> | | | | | | | | |
| 60. | <i>Thaivelai – Gynandropsis gynandra (L.) Briq.</i> | | | | | | | | |
| 61. | <i>Thutthi – Abutilon indicum (L.) Sweet</i> | | | | | | | | |
| 62. | <i>Thumbai – Leucas aspera (Willd.) Link</i> | | | | | | | | |
| 63. | <i>Thulasi – Ocimum sanctum L.</i> | | | | | | | | |
| 64. | <i>Thuthuvelai – Solanum trilobatum L.</i> | | | | | | | | |

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| 65. | <i>Thottarchinungi – Mimosa pudica L.</i> | | | | | | |
| 66. | <i>Naththaichoori – Spermacoce hispida L.</i> | | | | | | |
| 67. | <i>Naabi – Aconitum ferox Wall. ex Ser.</i> | | | | | | |
| 68. | <i>Nayuruvi – Achyranthes aspera L.</i> | | | | | | |
| 69. | <i>Nilavembu – Andrographis paniculata (Burm.f.) Wall. ex Nees</i> | | | | | | |
| 70. | <i>Nilapanai – Curculigo orchiodes Gaertn.</i> | | | | | | |
| 71. | <i>Nilaavarai – Senna alexandrina Mill. (or Cassia senna L.)</i> | | | | | | |
| 72. | <i>Neermulli – Hygrophila auriculata (Schumach.) Heine</i> | | | | | | |
| 73. | <i>Neichitti – Vernonia cinerea (L.) Less.</i> | | | | | | |
| 74. | <i>Nerunjil – Tribulus terrestris L.; Seppu Nerunjil – Indigofera enneaphylla L.</i> | | | | | | |
| 75. | <i>Pachilai – Garcinia xanthochymus Hook.f. ex T.Anderson</i> | | | | | | |
| 76. | <i>Paruththi – Gossypium arboreum L.; Semparuththi – Gossypium herbaceum L.</i> | | | | | | |
| 77. | <i>Parpadagam – Hedyotis corymbosa (L.) Lam.</i> | | | | | | |
| 78. | <i>Peedharohini – Coptis teeta Wall.</i> | | | | | | |
| 79. | <i>Peelai – Aerva lanata (L.) Juss. ex Schult.</i> | | | | | | |
| 80. | | | | | | | |

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| | <i>Pugaiyilai – Nicotiana tabacum L.</i> | | | | |
| 81. | <i>Perungayam – Ferula asafoetida L.</i> | | | | |
| 82. | <i>Poduthalai – Phyla nodiflora (L.) Greene</i> | | | | |
| 83. | <i>Ponnanganni – Alternanthera sessilis (L.) R.Br. ex DC.</i> | | | | |
| 84. | <i>Manjal – Curcuma longa L.; Kasthuri manjal – Curcuma aromatica Salisb.</i> | | | | |
| 85. | <i>Manjitti – Rubia cordifolia L.</i> | | | | |
| 86. | <i>Manathakkali – Solanum nigrum L.</i> | | | | |
| 87. | <i>Malli – Jasminum grandiflorum L.</i> | | | | |
| 88. | <i>Masipathiri – Artemisia nilagirica (C.B.Clarke) Pamp.</i> | | | | |
| 89. | <i>Mookkirattai – Boerhavia diffusa L.</i> | | | | |
| 90. | <i>Vasambu – Acorus calamus L.</i> | | | | |
| 91. | <i>Vandukoli – Cassia alata L.</i> | | | | |
| 92. | <i>Vaividangam – Embelia ribes Burm.f.</i> | | | | |
| 93. | <i>Vazhai – Musa paradisiaca L.</i> | | | | |
| 94. | <i>Vilamichamver – Plectranthus vettiveroides (Jacob) N.P.Singh & B.D.Sharma</i> | | | | |
| 95. | <i>Vishnukiranathi – Evolvulus alsinoides (L.) L.</i> | | | | |

96.
Venkayam – Allium cepa L.; Kaattu venkayam – Urginea indica (Roxb.) Kunth
97.
Venthayam – Trigonella foenum-graecum L.
98.
Vellarugu – Enicostemma axillare (Lam.) Raynal
99.
Velluli – Allium sativum L.
100.
Vaelai / Naaikadugu – Cleome viscosa L.

• **M10U2 Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Creepers, Climbers and Shrubs**

10.2.1 KODIGAL (MEDICINAL CREEPERS AND CLIMBERS)

1.
Avarai – Lablab purpureus (L.) Sweet
2.
Akasakarudan – Corallocarpus epigaeus (Rottler) C.B.Clarke
3.
Attuthumatti – Citrullus colocynthis (L.) Schrad.
4.
Eechuramooli – Aristolochia indica L.
5.
Utthamani – Pergularia daemia (Forsk.) Chiov.
6.
Uppilangodi – Mimosa paniculata L.
7.
Kallappai kizhangu – Gloriosa superba L.
- 8.

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| | <i>Kaliyana poosani – Benincasa hispida (Thunb.) Cogn.</i> | | | | | |
| 9. | <i>Kazharchikodi – Caesalpinia bonduc L.</i> | | | | | |
| 10. | <i>Kakkanam – Clitoria ternatea L.</i> | | | | | |
| 11. | <i>Kakkaikolli – Anamirta cocculus (L.) Wight & Arn.</i> | | | | | |
| 12. | <i>Kurinjan – Gymnema sylvestre R.Br. ex Schult.</i> | | | | | |
| 13. | <i>Kundri – Abrus precatorius L.</i> | | | | | |
| 14. | <i>Kovai – Coccinia grandis (L.) Voigt</i> | | | | | |
| 15. | <i>Seenthil – Tinospora cordifolia (Willd.) Miers</i> | | | | | |
| 16. | <i>Thaneervittan kizhanku – Asparagus racemosus Willd.</i> | | | | | |
| 17. | <i>Thippili / Thippiliver – Piper longum L.</i> | | | | | |
| 18. | <i>Thirakshai – Vitis vinifera L.</i> | | | | | |
| 19. | <i>Nancharuppan – Tylophora indica (Burm.f.) Merr.</i> | | | | | |
| 20. | <i>Nannari – Hemidesmus indicus (L.) R.Br.</i> | | | | | |
| 21. | <i>Neerbirahmi – Bacopa monnieri (L.) Wettst.</i> | | | | | |
| 22. | <i>Pirandai – Cissus quadrangularis L.</i> | | | | | |
| 23. | <i>Poonaikali – Mucuna pruriens (L.) DC.</i> | | | | | |
| 24. | | | | | | |

- Milagu / Sevviyam – Piper nigrum L.*
25. *Valmilagu – Piper cubeba L.f.*
26. *Musumusukkai – Mukia madraspatana (L.) M.R.Almeida & Sreek.*
27. *Mudakattran – Cardiospermum helicacabum (L.) Sw.*
28. *Vallarai – Centella asiatica (L.) Urb.*
29. *Vellarikai – Cucumis sativus L.*
30. *Vettilai – Piper betle L.*

10.2.2 PERUNCHEDIGAL (MEDICINAL SHRUBS)

1. *Agathi – Sesbania grandiflora (L.) Pers.*
2. *Amukkara – Withania somnifera (L.) Dunal*
3. *Azhavanam – Lawsonia inermis L. (Carl Linnaeus)*
4. *Aadathodai – Justicia adhatoda L.*
5. *Aamanakku – Ricinus communis L.*
6. *Aavarai – Cassia auriculata L.*
7. *Isangu – Clerodendrum inerme (L.) Gaertn.*
8. *Erukku – Calotropis gigantea (L.) W.T.Aiton*
9. *Kadalazhinjil – Salacia reticulata Wight*
10. *Kalli – Euphorbia ligularia L.*
11. *Kari vembu – Murraya koenigii (L.) Spreng.*
12. *Chundai – Solanum torvum Sw.*
13. *Sembarathai – Hibiscus rosa sinensis L.*
14. *Chembai – Sesbania sesban (L.) Merr.*
15. *Parangipattai – Smilax china L.*
16. *Thazhuthazhai – Clerodendrum phlomidis L.*

17. Thazhai – *Pandanus odorifer* (Lour.) Spreng.
18. Nanthiyavattam – *Tabernaemontana divaricata* L.
19. Notchi – *Vitex negundo* L.
20. Milakaranai – *Toddalia asiatica* L.

• **M10U3 Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Trees**

10.3. MARANGAL (MEDICINAL TREES)

1.
Asogu – Saraca asoca (Roxb.) W.J.de Wilde
2.
Atthi – Ficus racemosa L.; *Seemai atthi – Ficus carica* L.; *Pei atthi – Ficus hispida* L.f.
3.
Arasu – Ficus religiosa L.
4.
Azhinjil – Alangium salviifolium (L.f.) Wangerin
5.
Alamaram – Ficus benghalensis L.
6.
Lavangam – Syzygium aromaticum (L.) Merr. & L.M.Perry
7.
Lavangapattai – Cinnamomum verum J.Presl
8.
Iluppai – Madhuca longifolia (J.Koenig ex L.) J.F.Macbr.
9.
Ilaikalli – Euphorbia ligularia Roxb.
10.
Eechu - Sitreechu – Phoenix sylvestris (L.) Roxb., *Pereechu – Phoenix dactylifera* L.

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| 11. | <i>Usilamaram – Albizia odoratissima (L.f.) Benth.</i> | | | | | | |
| 12. | <i>Rudraksham – Elaeocarpus sphaericus (synonym of Elaeocarpus ganitrus Roxb.)</i> | | | | | | |
| 13. | <i>Etti – Strychnos nux-vomica L.</i> | | | | | | |
| 14. | <i>Elumichai – Citrus limon (L.) Osbeck; Kadaranaraththai – Citrus medica L.; Kichilipazham – Citrus aurantium L.</i> | | | | | | |
| 15. | <i>Udimaram – Lannea coromandelica (Houtt.) Merr.</i> | | | | | | |
| 16. | <i>Kadukkai – Terminalia chebula Retz.</i> | | | | | | |
| 17. | <i>Kamugu, Kalippakku – Areca catechu L.</i> | | | | | | |
| 18. | <i>Karungali – Acacia catechu (L.f.) Willd.</i> | | | | | | |
| 19. | <i>Karkadagasingi – Rhus succedanea L.</i> | | | | | | |
| 20. | <i>Kalyanamurrukku – Erythrina variegata L.</i> | | | | | | |
| 21. | <i>Kungilium – Shorea robusta C.F.Gaertn.</i> | | | | | | |
| 22. | <i>Kunthirikkam – Boswellia serrata Roxb. ex Colebr.</i> | | | | | | |
| 23. | <i>Kondrai – Cassia fistula L.</i> | | | | | | |
| 24. | <i>Chenbagam – Michelia champaca L.</i> | | | | | | |
| 25. | <i>Sandhanam – Santalum album L.</i> | | | | | | |

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| 26. | <i>Jaathikai, Jaathipathri – Myristica fragrans Houtt.</i> | | | | | | |
| 27. | <i>Sambirani – Styrax benzoin Dryand.</i> | | | | | | |
| 28. | <i>Sirunaagapoo – Mesua ferrea L.</i> | | | | | | |
| 29. | <i>Seekai – Acacia sinuata (Lour.) Merr.</i> | | | | | | |
| 30. | <i>Serankottai – Semecarpus anacardium L.f.</i> | | | | | | |
| 31. | <i>Thavasumurungai – Rungia parviflora Nees</i> | | | | | | |
| 32. | <i>Thalisapathiri – Abies spectabilis (D.Don) Spach</i> | | | | | | |
| 33. | <i>Thaandri – Terminalia bellirica (Gaertn.) Roxb.</i> | | | | | | |
| 34. | <i>Thengumaram – Cocos nucifera L.</i> | | | | | | |
| 35. | <i>Devadaru – Cedrus deodara (Roxb. ex D.Don) G.Don</i> | | | | | | |
| 36. | <i>Thettran – Strychnos potatorum L.f.</i> | | | | | | |
| 37. | <i>Naaval – Syzygium cumini (L.) Skeels</i> | | | | | | |
| 38. | <i>Neeradimuthu – Hydnocarpus laurifolia (Dennst.) Sleumer</i> | | | | | | |
| 39. | <i>Nuna – Morinda tinctoria Roxb.</i> | | | | | | |
| 40. | <i>Nelli – Phyllanthus emblica L.; Arunelli – Phyllanthus acidus (L.) Skeels</i> | | | | | | |
| 41. | <i>Nervalam – Croton tiglium L.</i> | | | | | | |

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| 42. | <i>Pala – Artocarpus heterophyllus Lam.</i> | | | | | | |
| 43. | <i>Palasu – Butea monosperma (Lam.) Taub.</i> | | | | | | |
| 44. | <i>Panai – Borassus flabellifer L.</i> | | | | | | |
| 45. | <i>Paadhiri – Stereospermum suaveolens (Roxb.) DC.</i> | | | | | | |
| 46. | <i>Paalai group – Manilkara hexandra (Roxb.) Dubard, Ezhilaipalai – Alstonia scholaris (L.) R.Br., Vetpaalai – Wrightia tinctoria R.Br., Kudsapaalai – Holarrhena pubescens Wall. ex G.Don, Theempaalai – Wattakaka volubilis (L.f.) Stapf</i> | | | | | | |
| 47. | <i>Pidangunari – Premna tomentosa Willd.</i> | | | | | | |
| 48. | <i>Pungu – Pongamia pinnata (L.) Pierre; Manipungu – Sapindus laurifolius Vahl</i> | | | | | | |
| 49. | <i>Puli – Tamarindus indica L.</i> | | | | | | |
| 50. | <i>Poovarasu – Thespesia populnea (L.) Sol. ex Corrêa</i> | | | | | | |
| 51. | <i>Magizh – Mimosa elengi L.</i> | | | | | | |
| 52. | <i>Mangusthan – Garcinia mangostana L.</i> | | | | | | |
| 53. | <i>Maramanjai – Coscinium fenestratum (Gaertn.) Colebr.</i> | | | | | | |
| 54. | <i>Madana kamappu – Cycas circinalis L.</i> | | | | | | |
| 55. | <i>Marakarai – Catunaregam spinosa (Thunb.) Tirveng.</i> | | | | | | |

56. *Maruthu – Terminalia arjuna (Roxb. ex DC.) Wight & Arn.*
57. *Masikkai – Quercus infectoria Oliv.*
58. *Maa – Mangifera indica L.*
59. *Madhulai – Punica granatum L.*
60. *Mavilangu – Crateva magna (Lour.) DC.*
61. *Murungai – Moringa oleifera Lam.*
62. *Moongil – Bambusa arundinacea (L.) Voss*
63. *Valampurikkai – Helicteres isora L.*
64. *Vadhanarayan – Delonix elata (L.) Gamble*
65. *Valuzhuvai – Celastrus paniculatus Willd.*
66. *Vilvam – Aegle marmelos (L.) Corrêa*
67. *Vilamaram – Limonia acidissima L.*
68. *Vellilothiram – Symplocos racemosa Roxb.*
69. *Vembu – Azadirachta indica A.Juss.*
70. *Vel – Acacia nilotica (L.) Willd. ex Delile*

• **M10U4 Gunapadam aspects and recent advances in pharmacognosy,**

phytochemistry and pharmacology across significant wild and domesticated medicinal plants

10.4. Botanical names, Vernacular names, Suvai (Taste), Thanmai (Character), Veeriyam (Potency) Pirivu (Division), Seigaigal (Actions), Pothugunam (General characters), Medicinal uses and Pharmacological aspects of the following medicinal plants

1. *Naattu akrottu* – *Aleurites moluccanus* (L.) Willd.
2. *Antharathamara* – *Pistia stratiotes* L.
3. *Anthimalli* – *Mirabilis jalapa* L.
4. *Ammayarkoonthal* – *Cuscuta reflexa* Roxb.
5. *Arivalmookupachilai* – *Sida acuta* Burm.f.
6. *Alari* – *Thevetia peruviana* (Pers.) K.Schum.
7. *Aruvatha* – *Ruta graveolens* L.
8. *Adaiyotti* – *Pupalia orbiculata* (Moench) A. Chev.
9. *Athondai* – *Capparis zeylanica* L.
10. *Ayilpattai* – *Chukrasia tabularis* A.Juss.
11. *Albagodapazham* – *Prunus domestica* L.
12. *Attrunetti* – *Neptunia oleracea* Lour.
13. *Aanaikatrashai* – *Agave americana* L.
14. *Aanaikundrimani* – *Adenantha pavonina* L.
15. *Aanaipuliyamaram* – *Adansonia digitata* L.
16. *Ingimaram* – *Caesalpinia coriaria* (Jacq.) Willd.
17. *Irattaipeimiratti* – *Anisomeles malabarica* (L.) R.Br. ex Sims
18. *Iravel sinni* – *Rheum emodi* Wall. ex Meissn.
19. *Ilandhai* – *Ziziphus mauritiana* Lam.
20. *Elavu* – *Ceiba pentandra* (L.) Gaertn.
21. *Mullilavu* – *Bombax ceiba* L.
22. *Ezhathalari* – *Plumeria rubra* L.
23. *Uga / Kalarva* – *Salvadora persica* L.
24. *Uzhalattri* – *Ficus exasperata* Vahl
25. *Erisalai* – *Naravelia zeylanica* (L.) DC.

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| 26. Eliamanakku – <i>Jatropha curcas</i> L. | | | | | |
| 27. Elikadhilai – <i>Merremia emarginata</i> (Burm.f.) Hallier f. | | | | | |
| 28. Ezhuthanipoondu – <i>Launaea pinnatifida</i> (Willd.) Sch.Bip. ex Kuntze | | | | | |
| 29. Ivirali – <i>Diplocyclos palmatus</i> (L.) C.Jeffrey | | | | | |
| 30. Odukkann – <i>Cleistanthus collinus</i> (Roxb.) Benth. ex Hook.f. | | | | | |
| 31. Kanchankorai – <i>Ocimum album</i> L. | | | | | |
| 32. Kadambu – <i>Anthocephalus cadamba</i> Roxb. ex Miq. | | | | | |
| 33. Kadalpaasi – <i>Gracilaria lichenoides</i> Greville | | | | | |
| 34. Kadarpalai – <i>Argyreia nervosa</i> (Burm.f.) Bojer | | | | | |
| 35. Kadalhengai – <i>Lodoicea maldivica</i> (J.F.Gmel.) Pers. | | | | | |
| 36. Kanappoondu – <i>Exacum pedunculatum</i> L. | | | | | |
| 37. Kambalipoochi chedi – <i>Morus alba</i> L. | | | | | |
| 38. Karpoorapul – <i>Cymbopogon citratus</i> (DC. ex Nees) Stapf | | | | | |
| 39. Kalumicchamkai – <i>Citrus hystrix</i> DC. | | | | | |
| 40. Kalluruvi – <i>Ammania baccifera</i> L. | | | | | |
| 41. Kalarva – <i>Salvadora persica</i> L. | | | | | |
| 42. Karipalai – <i>Tylophora indica</i> (Burm.f.) Merr. | | | | | |
| 43. Karkovai – <i>Melothria heterophylla</i> L. | | | | | |
| 44. Karpasi – <i>Parmelia perlata</i> (L.) Ach. | | | | | |
| 45. Karthamarai – <i>Smilax zeylanica</i> L. | | | | | |
| 46. Kaasa – <i>Memecylon umbellatum</i> L. | | | | | |
| 47. Kaasirathnam – <i>Quamoclit pennata</i> (L.) Sweet | | | | | |
| 48. Kaatuamanakku – <i>Jatropha curcas</i> L. | | | | | |
| 49. Kaattu illuppai – <i>Madhuca indica</i> (J.F.Gmel.) J.F.Macbr. | | | | | |
| 50. Kaattu ulunthu – <i>Teramnus labialis</i> (L.f.) Spreng. | | | | | |
| 51. Kaattu Elumichai – <i>Citrus hystrix</i> | | | | | |
| 52. Kaattu ellu – <i>Sesamum prostratum</i> Benth. | | | | | |
| 53. Kaattu karuvappattai – <i>Cinnamomum iners</i> Reinw. ex Blume | | | | | |
| 54. Kaattu kasthuri – <i>Abelmoschus moschatus</i> (L.) Medik. | | | | | |
| 55. Kaattu kirambu – <i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven | | | | | |
| 56. Kattu kollu – <i>Cassia absus</i> L. | | | | | |
| 57. Kaattu sathakuppai – <i>Anethum graveolens</i> L. | | | | | |

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| 58. | <i>Kaattu thummati – Cucumis trigonus Roxb.</i> | | | | | | |
| 59. | <i>Kaattu jathikkai – Myristica malabarica Lam.</i> | | | | | | |
| 60. | <i>Kaattu pagal – Momordica dioica Roxb. ex Willd.</i> | | | | | | |
| 61. | <i>Kaattu peipudal – Trichosanthes lobata Roxb.</i> | | | | | | |
| 62. | <i>Kaattu mullangi – Blumea lacera (Burm.f.) DC.</i> | | | | | | |
| 63. | <i>Kaattuvagai – Albizia lebbeck (L.) Benth.</i> | | | | | | |
| 64. | <i>Kaaivallikodi – Dioscorea alata L.</i> | | | | | | |
| 65. | <i>Kaanamvazhai – Commelina benghalensis L.</i> | | | | | | |
| 66. | <i>Kittikizhangu – Acalypha fruticosa Forssk.</i> | | | | | | |
| 67. | <i>Kidaichi – Aeschynomene indica L.</i> | | | | | | |
| 68. | <i>Kiranthinayagam – Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.</i> | | | | | | |
| 69. | <i>Kizhiyural – Pterospermum acerifolium (L.) Willd.</i> | | | | | | |
| 70. | <i>Kilukiluppai – Crotalaria retusa L.</i> | | | | | | |
| 71. | <i>Kunmakudori - Polygonum hydropiper L.</i> | | | | | | |
| 72. | <i>Kuthiraikulambadi - Sagittaria sagittifolia L.)</i> | | | | | | |
| 73. | <i>Kumizhamaram - Gmelina arborea Roxb.</i> | | | | | | |
| | <i>Nilakumizh - Gmelina asiatica L.</i> | | | | | | |
| 74. | | | | | | | |

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| | <i>Kurukkathi - Hiptage benghalensis (L.) Kurz</i> | | | | | |
| 75. | <i>Kuruvitchi - Ehretia microphylla Lam.</i> | | | | | |
| 76. | <i>Koothamkuthambai - Lantana indica L. Roxb.</i> | | | | | |
| 77. | <i>Koontharpanai - Caryota urens L.</i> | | | | | |
| 78. | <i>Konchi/Kattukonchi - Glycosmis arborea (Roxb.) DC.</i> | | | | | |
| 79. | <i>Kollukaivelai - Tephrosia purpurea (L.) Pers.</i> | | | | | |
| 80. | <i>Kodagasalai - Rungia repens (L.) Nees</i> | | | | | |
| 81. | <i>Kopuramthangi - Andrographis echiioides (L.) Nees</i> | | | | | |
| 82. | <i>Kowrivaalpul - Perotis indica (L.) Kuntze</i> | | | | | |
| 83. | <i>Sanappu - Crotalaria juncea L.</i> | | | | | |
| 84. | <i>Savukku - Casuarina equisetifolia L.</i> | | | | | |
| 85. | <i>Savvarisi - Metroxylon sagu Rottb.</i> | | | | | |
| 86. | <i>Sanninayagam - Acemella oleracea (L.) R.K. Jansen</i> | | | | | |
| 87. | <i>Sayamaram - Caesalpinia sappan L.</i> | | | | | |
| 88. | <i>Sinni - Acalypha fruticosa Forssk.</i> | | | | | |
| 89. | <i>Sukkankai - Cucumis melo L.</i> | | | | | |
| 90. | | | | | | |

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| | <i>Sulukkunayagam - Panicum antidotale Retz.</i> | | | | | |
| 91. | <i>Soorai - Ziziphus oenoplia (L.) Mill.</i> | | | | | |
| 92. | <i>Saevaganarkizhangu - Gloriosa superba L.</i> | | | | | |
| 93. | <i>Thagarai - Senna tora (L.) Roxb.)</i> | | | | | |
| 94. | <i>Thakkolam Illicium verum Hook.f.</i> | | | | | |
| 95. | <i>Thara - Fumaria parviflora Lam.</i> | | | | | |
| 96. | <i>Thalipanai - Corypha umbraculifera L.</i> | | | | | |
| 97. | <i>Thumbilikkai - Diospyros peregrina (Gurke) P. Royen</i> | | | | | |
| 98. | <i>Naralai - Cayratia pedata (Lam.) Gagnep.</i> | | | | | |
| 99. | <i>Nagamalli - Rhinacanthus nasutus (L.) Kurz</i> | | | | | |
| 100. | <i>Naanal - Saccharum spontaneum L.</i> | | | | | |
| 101. | <i>Nilakadambu - Asarum europaeum L.</i> | | | | | |
| 102. | <i>Nilapoosani - Ipomoea mauritiana Jacq.</i> | | | | | |
| 103. | <i>Nilampurandi - Desmodium triflorum (L.) DC.</i> | | | | | |
| 104. | <i>Ninrarsunungi - Mimosa hamata Willd.</i> | | | | | |
| 105. | <i>Neerpoola - Phyllanthus reticulatus Poir.</i> | | | | | |
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| Neeralari - <i>Polygonum barbatum</i> (L.) H. Hara) | | | | | |
| 107. Neermaelneruppu - <i>Ammannia baccifera</i> L. | | | | | |
| 108. Nettilingam - <i>Polyalthia longifolia</i> (Sonn.) Thwaites | | | | | |
| 109. Pavalamalli - <i>Nyctanthes arbor-tristis</i> L. | | | | | |
| 110. Pallipoondu - <i>Striga asiatica</i> (L.) Kuntze) | | | | | |
| 111. Paalmaram - <i>Wrightia species</i> L. | | | | | |
| 112. Pavattai - <i>Pavetta indica</i> L. | | | | | |
| 113. Pisinpattai - <i>Litsea chinensis</i> (Lam.) Juss. | | | | | |
| 114. Pirai - <i>Streblus asper</i> Lour. | | | | | |
| 115. Pilavaikolli - <i>Anisochilus carnosus</i> (L.f.) Wall. ex Benth. | | | | | |
| 116. Peenari maram - <i>Sterculia foetida</i> L. | | | | | |
| 117. Pulladi - <i>Desmodium gangeticum</i> (L.) DC. | | | | | |
| 118. Ponmusuttai - <i>Sida acuta</i> Burm.f. | | | | | |
| 119. Mantharai - <i>Bauhinia purpurea</i> L. | | | | | |
| 120. Marima - <i>Spondias pinnata</i> (L.f.) Kurz | | | | | |
| 121. Marul - <i>Sansevieria roxburghiana</i> Schult. & Schult.f. | | | | | |
| 122. | | | | | |

Musarkathilai - Ipomoea pes-caprae (L.) R.Br.

123.

Musuttai - Rivea ornata Choisy

124.

Munnai - Premna corymbosa (Burm.f.) Rottl. & Willd.

125.

Mothagavalli - Sterculia foetida L.

126.

Vallaikodi - Convolvulus repens L.

127.

Vagai - Albizia lebbbeck (L.) Benth.

128.

Vidather - Dichrostachys cinerea (L.) Wight & Arn.

129.

Virali - Dodonaea viscosa (L.) Jacq.

130.

Vengai - Pterocarpus marsupium Roxb.

• **M10U5 Pharmacological and Therapeutic Insights into Global Medicinal Plants**

10.5. Identification, Botanical names, Vernacular names, Family, Seigaigal (Actions), Active constituents, Pharmacological and Therapeutic uses

1.

Adapathiyai - Holostemma adakodien Schult.

2.

Ayyani pala - Artocarpus hirsutus Lam.

3.

Aadalangkodi - Sarcostemma intermedium Wight & Arn.

4.

Arogyapachchai - Trichopus zeylanicus Gaertn.;

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| | <i>Azhukanni – Drosera indica L.</i> | | | | | | |
| 6. | <i>Aavu maram – Holoptelea integrifolia (Roxb.) Planch.</i> | | | | | | |
| 7. | <i>Irukolli – Drypetes roxburghii (Wall.) Hurus.</i> | | | | | | |
| 8. | <i>Irumbilivithai – Diospyros ferrea (Willd.) Bakh.</i> | | | | | | |
| 9. | <i>Irupaval – Gnaphalium luteo-album L.</i> | | | | | | |
| 10. | <i>Irupulai – Dalbergia sissoo DC.</i> | | | | | | |
| 11. | <i>Eenthupanai – Phoenix sylvestris (L.) Roxb.</i> | | | | | | |
| 12. | <i>Udharkodi – Ichnocarpus frutescens (L.) W.T.Aiton</i> | | | | | | |
| 13. | <i>Uthira vengai – Pterocarpus marsupium Roxb.</i> | | | | | | |
| 14. | <i>Urutti – Habenaria intermedia D.Don</i> | | | | | | |
| 15. | <i>Ephedra – Ephedra gerardiana Wall. ex Stapf</i> | | | | | | |
| 16. | <i>Elumpurukki – Litsea glutinosa (Lour.) C.B.Rob.</i> | | | | | | |
| 17. | <i>Elumbotti – Ormocarpum sennoides (Willd.) DC.</i> | | | | | | |
| 18. | <i>Eganayagam – Salacia fruticosa Heyne ex Lawson</i> | | | | | | |
| 19. | <i>Kaseru – Scirpus grossus L.f.</i> | | | | | | |
| 20. | <i>Kadal keerai – Scaevola frutescens (Mill.) Seem.</i> | | | | | | |
| 21. | | | | | | | |

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| | <i>Kathi avarai – Canavalia gladiata (Jacq.) DC.</i> | | | | | | |
| 22. | <i>Karpooramaram – Cinnamomum camphora (L.) J.Presl</i> | | | | | | |
| 23. | <i>Karpoora pul – Cymbopogon schoenanthus (L.) Spreng.</i> | | | | | | |
| 24. | <i>Karuvilanchikudam – Smilax zeylanica L.</i> | | | | | | |
| 25. | <i>Karudapachchai – Selaginella rupestris Spring</i> | | | | | | |
| 26. | <i>Karunthamarai – Euryale ferox Salisb.</i> | | | | | | |
| 27. | <i>Karumpoola – Phyllanthus reticulatus Poir.</i> | | | | | | |
| 28. | <i>Karuvallarai – Viola odorata L.</i> | | | | | | |
| 29. | <i>Kalvazhai – Canna indica L.</i> | | | | | | |
| 30. | <i>Kallorivanchi – Rotula aquatica Lour.</i> | | | | | | |
| 31. | <i>Kasithumbai – Impatiens balsamina L.</i> | | | | | | |
| 32. | <i>Kasini – Cichorium intybus L.</i> | | | | | | |
| 33. | <i>Kachchi kollu – Phaseolus lunatus L.</i> | | | | | | |
| 34. | <i>Kaadaikanni – Avena sativa L.</i> | | | | | | |
| 35. | <i>Kattu inji – Zingiber zerumbet (L.) Sm.</i> | | | | | | |
| 36. | <i>Kattu valli – Dioscorea wallichii Hook.f.</i> | | | | | | |
| 37. | | | | | | | |

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| 38. | <i>Kattu velvenkayam – Scilla indica Baker</i> | | | | | |
| 39. | <i>Kaanthari milagai – Capsicum frutescens L.</i> | | | | | |
| 40. | <i>Kiluvai – Commiphora caudata (Wight & Arn.) Engl.</i> | | | | | |
| 41. | <i>Keerippaalai – Leptadenia reticulata (Retz.) Wight & Arn.</i> | | | | | |
| 42. | <i>Kusumpa chedi – Carthamus tinctorius L.</i> | | | | | |
| 43. | <i>Kuravankandamooli – Apama siliquosa (Lour.) Merr.</i> | | | | | |
| 44. | <i>Kurunji – Strobilanthes kunthiana (Wall. ex Nees) T.Anderson</i> | | | | | |
| 45. | <i>Kuzhinaival – Myrtus communis L.</i> | | | | | |
| 46. | <i>Kurumbal – Berberis lycium Royle</i> | | | | | |
| 47. | <i>Koosu kilangu – Brassica rapa L.</i> | | | | | |
| 48. | <i>Koolkodi – Ziziphus nummularia (Burm.f.) Wight & Arn.</i> | | | | | |
| 49. | <i>Kesavarthini – Centrathium punctatum Cass.</i> | | | | | |
| 50. | <i>Kaiyapputai – Melaleuca leucadendra (L.) L.</i> | | | | | |
| 51. | <i>Kottai kala – Flacourtia indica (Burm.f.) Merr.</i> | | | | | |
| 52. | <i>Kolukattai mantharai – Bauhinia acuminata L.</i> | | | | | |
| | <i>Kodampuli – Garcinia cambogia (Gaertn.) Desr.</i> | | | | | |

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| 53. | <i>Konghilavam – Cochlospermum gossypium DC.</i> | | | | | | | | |
| 54. | <i>Sanjeevi – Selaginella bryopteris (L.) Baker</i> | | | | | | | | |
| 55. | <i>Sathai otti – Peristrophe paniculata (Forssk.) Brummitt</i> | | | | | | | | |
| 56. | <i>Saboo leard – Stephania rotunda Lour.</i> | | | | | | | | |
| 57. | <i>Samuthira pazham – Barringtonia acutangula (L.) Gaertn.</i> | | | | | | | | |
| 58. | <i>Sarpagandha – Rauvolfia serpentina (L.) Benth. ex Kurz</i> | | | | | | | | |
| 59. | <i>Sallattu virai – Lactuca serriola L.</i> | | | | | | | | |
| 60. | <i>Salmukira – Gynocardia odorata R.Br.</i> | | | | | | | | |
| 61. | <i>Calendula – Calendula officinalis L.</i> | | | | | | | | |
| 62. | <i>Sinduram – Bixa orellana L.</i> | | | | | | | | |
| 63. | <i>Sinangu – Lagerstroemia parviflora Roxb.</i> | | | | | | | | |
| 64. | <i>Paal nerunji – Silybum marianum (L.) Gaertn.</i> | | | | | | | | |
| 65. | <i>Sivapputhuthi – Abroma augusta (L.) L.f.</i> | | | | | | | | |
| 66. | <i>Chiru ilanthai – Ximenia americana L.</i> | | | | | | | | |
| 67. | <i>Sirupoonakkali – Passiflora foetida L.</i> | | | | | | | | |
| 68. | <i>Cinchona – Cinchona officinalis L.</i> | | | | | | | | |

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| 69. | <i>Seabuck horn – Hippophae rhamnoides L.</i> | | | | | | |
| 70. | <i>Jimikki poo – Vicoa indica (L.) DC.</i> | | | | | | |
| 71. | <i>Seemai alavanam – Peganum harmala L.</i> | | | | | | |
| 72. | <i>Seemaikarpooora ilai – Salvia officinalis L.</i> | | | | | | |
| 73. | <i>Seemaikitchili – Hedychium spicatum Sm.</i> | | | | | | |
| 74. | <i>Seemai thuthi – Althaea officinalis L.</i> | | | | | | |
| 75. | <i>Jeevakam – Malaxis rheedei Rchb.f.</i> | | | | | | |
| 76. | <i>Sulli – Barleria buxiflora L.f.</i> | | | | | | |
| 77. | <i>Senkathari – Capparis sepiaria L.</i> | | | | | | |
| 78. | <i>Chemmaram – Aphanamixis polystachya (Wall.) R.Parker</i> | | | | | | |
| 79. | <i>Chemmulli – Barleria prionitis L.</i> | | | | | | |
| 80. | <i>Semmulli – Barleria buxifolia L.f.</i> | | | | | | |
| 81. | <i>Jothi virutcham – Cinnamomum camphora (L.) J.Presl</i> | | | | | | |
| 82. | <i>Sorghamaram – Simarouba glauca DC.</i> | | | | | | |
| 83. | <i>Somakodi – Ephedra gerardiana Wall. ex Stapf</i> | | | | | | |
| 84. | <i>Tagarai – Valeriana wallichii DC.</i> | | | | | | |

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| 85. | <i>Tharuppai – Imperata cylindrica (L.) Raeusch.</i> | | | | | | |
| 86. | <i>Thindika – Rhus parviflora Roxb.</i> | | | | | | |
| 87. | <i>Thiruvottu maram – Crescentia cujete L.</i> | | | | | | |
| 88. | <i>Theenda nazhi – Biophytum sensitivum (L.) DC.</i> | | | | | | |
| 89. | <i>Theepoodu – Lepidagathis cristata Willd.</i> | | | | | | |
| 90. | <i>Thumbi keeraai – Leucas cephalotes (Roth) Spreng.</i> | | | | | | |
| 91. | <i>Thumburu – Zanthoxylum armatum DC.</i> | | | | | | |
| 92. | <i>Theyilai – Camellia sinensis (L.) Kuntze</i> | | | | | | |
| 93. | <i>Thaila pul – Cymbopogon martinii (Roxb.) W.Watson</i> | | | | | | |
| 94. | <i>Thailamaram – Eucalyptus globulus Labill.</i> | | | | | | |
| 95. | <i>Thozhukanni – Codariocalyx motorius (Houtt.) H.Ohashi</i> | | | | | | |
| 96. | <i>Nanjundam – Ceriscoides turgida (Roxb.) Tirveng.</i> | | | | | | |
| 97. | <i>Naruvalli – Corchorus capsularis L.</i> | | | | | | |
| 98. | <i>Nari pugaiyilai – Digitalis purpurea L.</i> | | | | | | |
| 99. | <i>Nithyakalyani – Catharanthus roseus (L.) G.Don</i> | | | | | | |
| 100. | <i>Nila sampangi – Polianthes tuberosa L.</i> | | | | | | |

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| 101. | <i>Neer nochi – Vitex trifolia L.</i> | | | | | | | | |
| 102. | <i>Nirvanji – Salix tetrasperma Roxb.</i> | | | | | | | | |
| 103. | <i>Neelamulli – Salvia officinalis L.</i> | | | | | | | | |
| 104. | <i>Nelambari – Ecbolium viride (Forssk.) Alston</i> | | | | | | | | |
| 105. | <i>Nettavil – Antiaris toxicaria Lesch.</i> | | | | | | | | |
| 106. | <i>Neli gothumai – Fagopyrum esculentum Moench</i> | | | | | | | | |
| 107. | <i>Nethira poondu – Blepharis maderaspatensis (L.) B.Heyne ex Roth</i> | | | | | | | | |
| 108. | <i>Pasunkottai – Pistacia vera L.</i> | | | | | | | | |
| 109. | <i>Paranyavani – Coleus forskohlii (Willd.) Briq.</i> | | | | | | | | |
| 110. | <i>Palaiudachi – Oroxylum indicum (L.) Kurz</i> | | | | | | | | |
| 111. | <i>Palvalipoondu – Spilanthes acmella (L.) L.</i> | | | | | | | | |
| 112. | <i>Pavala kurinji – Lagerstroemia indica L.</i> | | | | | | | | |
| 113. | <i>Pazham pasi – Sida cordata (Burm.f.) Borss.Waalk.</i> | | | | | | | | |
| 114. | <i>Basanthi – Reinwardtia indica Dumort.</i> | | | | | | | | |
| 115. | <i>Pasil maram – Ginkgo biloba L.</i> | | | | | | | | |
| 116. | <i>Pachotti – Symplocos cochinchinensis (Lour.) S.Moore</i> | | | | | | | | |

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| 117. | <i>Padakizhangu – Cyclea peltata (Lam.) Hook.f. & Thomson</i> | | | | | |
| 118. | <i>Perunkurinchan – Marsdenia tenacissima (Roxb.) Wight & Arn.</i> | | | | | |
| 119. | <i>Pushkaramulam – Inula racemosa Hook.f.</i> | | | | | |
| 120. | <i>Pulichuvadi – Ipomoea pes-tigridis L.</i> | | | | | |
| 121. | <i>Pulinagachuvadi – Martynia annua L.</i> | | | | | |
| 122. | <i>Pumaruttu – Lagerstroemia flos-reginae Retz.</i> | | | | | |
| 123. | <i>Poonaimesai – Orthosiphon stamineus Benth.</i> | | | | | |
| 124. | <i>Perumpulladi – Desmodium gangeticum (L.) DC.</i> | | | | | |
| 125. | <i>Maha vilvam – Naringi crenulata (Roxb.) Nicolson</i> | | | | | |
| 126. | <i>Manjal arali – Thevetia peruviana (Pers.) K.Schum.</i> | | | | | |
| 127. | <i>Mayiladum sikai – Actiniopteris dichotoma Bedd.</i> | | | | | |
| 128. | <i>Maramalli – Millingtonia hortensis L.f.</i> | | | | | |
| 129. | <i>Marikozhundhu (Marjoram) – Origanum majorana L.</i> | | | | | |
| 130. | <i>Marundhukoorkan – Coleus forskohlii (Willd.) Briq.</i> | | | | | |
| 131. | <i>Manoranjitham – Artabotrys hexapetalus (L.f.) Bhandari</i> | | | | | |
| 132. | <i>Maagali kizhangu – Decalepis hamiltonii Wight & Arn.</i> | | | | | |

133.	<i>Mangai inji – Curcuma amada Roxb.</i>					
134.	<i>Milagai poondur – Vinca pusilla Hook.f.</i>					
135.	<i>Musukkaipalai – Wrightia tomentosa (Roxb.) Roem. & Schult.</i>					
136.	<i>Mudavattukaal – Drynaria quercifolia (L.) J.Sm.</i>					
137.	<i>Mullukkala – Berberis aristata DC.</i>					
138.	<i>Moovilai – Pseudarthria viscida (L.) Wight & Arn.</i>					
139.	<i>Yanai apple – Dillenia indica L.</i>					
140.	<i>Yanai chavutadi – Elephantopus scaber L.</i>					
141.	<i>Rohini – Soymida febrifuga (Roxb.) A.Juss.</i>					
142.	<i>Roma virutcham – Euodia lunu-ankenda</i>					
143.	<i>Rosemary – Salvia rosmarinus Spenn.</i>					
144.	<i>Thuja – Thuja occidentalis L.</i>					
145.	<i>Velakkai – Woodfordia fruticosa (L.) Kurz</i>					
		4	20	40	60	120
Semester No : 4						

2A Module Number	2B Modules & units	2C Number of Credits	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
11	M-11 Purification Methods of Herbal Raw drugs, Preparation of Higher-Order Medicines and Monographic Studies of Medicinal Plants This module deals with the significance of purification, various purification methods and physicochemical changes before and after purification; Herbals used for making higher order medicines; Monographs of important medicinal plants. • M11U1 Sutthi Muraigalin Mukkiyathuvam (Significance of Purification) 11.1.1. <i>Mooligaikalin Sutthi muraigal</i> 11.1.1.1. <i>Pothu Sutthi muraigal</i> (Purifications methods) for Leaves, Flowers, Bark, Root, Tubers 11.1.1.2. Single step purification process 11.1.1.3. Multi step purification process 11.1.2. Significance of purification process • M11U2 Thathu Mattrum Jeeva Porutkalai Sutthi Seiya Payanpadum Mooligaikal 11.2. <i>Thathu mattrum Jeeva porutkalai sutthi seiya payanpadum mooligaikal</i> (Herbs	2	10	20	30	60

used for the purification of Metal, minerals, animal and animal by products)

11.2.1. *Ulogangal*

11.2.2. *Padanangal*

11.2.3. *Uparasangal*

• **M11U3 Industrial Techniques and Equipment for Herbal Purification**

11.3.1. Industrial Techniques for Herbal Purification

11.3.1.1. Mechanical sorting and grading

11.3.1.2. Washing

11.3.1.3. Drying

11.3.1.4. Steam Sterilization or Pasteurization

11.3.1.5. Gamma Irradiation or UV Treatment

11.3.2. Industrial equipment for herbal purification

11.3.2.1. Mills

11.3.2.2. Decanters and Separators

• **M11U4 Mooligaikal (Herbals) used for preparing Higher-order Medicines**

11.4.1. *Parpamakkum moooligaikal*

11.4.2. *Chenduramakkum moooligaikal*

11.4.3. *Chunnamakkum moooligaikal*

11.4.4. *Kattaakkum moooligaikal*

11.4.5. *Kalangakkum mooligaikal*

11.4.6. *Urukku seiya payanpadum mooligaikal*

11.4.7. *Rasamani seiya payanpadum mooligaikal*

	• M11U5 Monographs of Medicinal Plants 11.5. Monographs on Medicinal Plants 11.5.1.Types 11.5.2. General format - description, part used, synonym, botanical name, family name, author citation and distribution, vernacular names, Identification by macroscopy, microscopy, powder microscopy, identification by TLC/GC/HPLC, etc, constituents, Important Formulations, Properties and Action, Therapeutic Uses, Dose, Storage condition, Clinical Studies, Pharmacological studies, Adulterants/Substitutes, Adverse Reaction, Reference. 11.5.3. Authorities to publish monographs.					
12	M-12 Mooligai Maruthuva Payanpadugal (Therapeutic Applications of Medicinal Plants) This module deals with therapeutic values of medicinal plants for selected diseases, actions and pharmacological activities of plants. • M12U1 Mode of Action and Pharmacological Profile of Herbals 12.1.1. Action-Specific Phytomedicines 12.1.1.1. Analgesics 12.1.1.2. Antipyretics 12.1.1.3. CNS depressants and stimulants 12.1.1.4. Immunomodulators	2	10	20	30	60

12.1.1.5. COX-2 inhibitors					
12.1.1.6. Vasodilators					
12.1.1.7. Virucidal biocides					
12.1.1.8. Phyto-Autacoids					
12.1.1.9. Phyto-estrogens					
12.1.1.10. Phyto-androgens					
12.1.2. Activity-Specific Phytomedicines					
12.1.2.1. Neuroprotective					
12.1.2.2. Cardioprotective					
12.1.2.3. Anti-inflammatory					
12.1.2.4. Antiulcer					
12.1.2.5. Hepatoprotective					
12.1.2.6. Antilipidemic					
12.1.2.7. Thrombolytic					
12.1.2.8. Lithotriptic					
12.1.2.9. Antimicrobial					
12.1.2.10. Anticancer					

12.1.3. Medicinal plants used in veterinary science

• **M12U2 The Pharmacological Potential of Herbs in Different Physiological Systems**

12.2.1. Endocrine system

12.2.2. Musculoskeletal system

12.2.3. Cardiovascular system

12.2.4. Respiratory system

12.2.5. Gastro intestinal system

12.2.6. Hepatobiliary system

12.2.7. Genito-urinary system

• **M12U3 Herbo-medical management for Specific diseases and injuries**

12.3.1. Gastro Esophageal Reflux Diseases (GERD)

12.3.2. Obesity

12.3.3. Polycystic Ovarian syndrome (PCOS)

12.3.4. Chronic Kidney Diseases (CKD)

12.3.5. Cholelithiasis

12.3.6. Herpes zoster

12.3.7. Non-Communicable Diseases - Diabetes mellitus, Hypertension, Carcinoma, Arthritis, Parkinson's disease

12.3.8. Phytomedicines for Sports injuries and *Kalari, Malyutham, Silambam, etc.*, (Martial arts) injuries

• **M12U4 Herbals used in the treatment of Thoal noigal (Skin diseases)**

12.4.1. *Thoal noigal* (Skin diseases)

12.4.1.1 *Kanakadi* (Urticaria)

12.4.1.2. *Sori/namaichal* (Pruritis)

12.4.1.3. *Karappan* (Eczema)

12.4.1.4. *Kalanjakappadai* (Psoriasis)

	12.4.1.5. <i>Venpulli/ Venpadai/venkuttam</i> (Leucoderma) 12.4.1.6. <i>Padarthamarai</i> (Tinea) 12.4.1.7. <i>Pilavai</i> (Carbuncles) 12.4.1.8. <i>Viranam/Punngal</i> (Wounds) 12.4.1.9. <i>Thee punn</i> (Burns) and <i>Vennir punn</i> (Scalds) 12.4.1.10. <i>Kuttam/Kurai noi</i> (Hansen's diseases) • M12U5 Therapeutic Applications of Herbal Medicines in Ophthalmology and ENT 12.5.1. <i>Kann noigal</i> (Ophthalmic diseases) 12.5.2. <i>Kaathu noigal</i> (Ear diseases) 12.5.3. <i>Mooku noigal</i> (Nasal diseases) 12.5.4. <i>Thondai noigal</i> (Throat diseases)					
		4	20	40	60	120
Semester No : 5						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
13	M-13 Analytical standardization of herbal drugs	2	10	20	30	60

This module deals with Quality of herbals, Standardization parameters of herbals, Shelf life studies.

• M13U1 Physicochemical parameters of herbal powder/Chooranam

13.1.1. Description (*Chooranam* - powder)

13.1.2. Particle size

13.1.3. Loss on drying

13.1.4. Total Ash

13.1.5. Acid insoluble ash

13.1.6. Water soluble extractive

13.1.7. Alcohol soluble extractive,

13.1.8. n-Hexane soluble extractive (Soxhlet method)

13.1.9. pH

13.1.10. Volatile oil content

13.1.11. Foreign matter

**• M13U2 Physicochemical parameters of plant derived additives
oil/resin/sugar/jaggery/Gum**

13.2.1. Acid value

13.2.2. Saponification value

13.2.3. Iodine value

13.2.4. Peroxide value

13.2.5. Rancidity

13.2.6. Refractive index

13.2.7. Specific gravity

13.2.8. Reichert Meissl value

13.2.9. Polenske value

13.2.10. Viscosity

13.2.11. Melting point

13.2.12. Congealing point

13.2.13. Estimation of sugar (reducing/total)

13.2.14. Optical rotation

• M13U3 Phytochemical assays

13.3.1. Quantitative phytochemical assays for the following 13.3.1.1. Phenols 13.3.1.2. Tannins 13.3.1.3. Triterpenes 13.3.1.4. Steroids 13.3.1.5. Flavonoids 13.3.1.6. Coumarins 13.3.1.7. Alkaloids 13.3.1.8. Saponins 13.3.1.9. Proteins 13.3.1.10. Plant acids 13.3.1.11. Glycosides 13.3.1.12. Quinones 13.3.1.13. Anthraquinones • M13U4 Plant Identification Test through Instrumental analysis 13.4.1. Thin layer chromatography identity test (TLC) 13.4.2. High Performance Thin Layer Chromatography identity test (HPTLC) 13.4.3. Gas Chromatography identity tests (GC) 13.4.4. Plant identification software and databases • M13U5 Shelf life study and Guidelines 13.5.1. Shelf life and its importance 13.5.2. Factors affecting shelf life of herbal products 13.5.3. Pathogens associated with medicinal plants 13.5.4. Different methods to detect mycotoxin 13.5.5. Decontamination techniques 13.5.6. Equipment - Stability Chamber 13.5.7. Guideline of International Council for Harmonisation (ICH) 13.5.8. Quality Standards 13.5.9. Good storage practice (GSP)					
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14	M-14 Phytochemicals / Phytopharmaceuticals, Chromatographic techniques for isolation and Bioinformatics This module helps to acquire knowledge on extraction methods, Chromatographic and Spectral methods, Molecular docking in structure-based drug discovery • M14U1 Essence of phytopharmaceuticals 14.1.1. List of proven Phytopharmaceuticals and their therapeutic uses 14.1.1.1. Atropine 14.1.1.2. Caffeine 14.1.1.3. Cocaine 14.1.1.4. Ginkgolides 14.1.1.5. Ginsenosides 14.1.1.6. Podophyllotoxin 14.1.1.7. Artemisinin 14.1.1.8. Digoxin 14.1.1.9. (L)-dopa	2	10	20	30	60
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14.1.1.10. Diosgenin						
14.1.1.11. Embelin						
14.1.1.12. Plumbagin						
14.1.1.13. Morphine						
14.1.1.14. Vincristine						
14.1.1.15. Vinblastine						
14.1.1.16. Emetine						
14.1.1.17. Ephedrine						
14.1.1.18. Berberine						
14.1.1.19. Silymarin						
14.1.1.20. Quinine						
14.1.1.21. Colchicine						
14.1.1.22. Vasicine						
14.1.1.23. Andrographolide						
14.1.1.24. Piperine						
14.1.1.25. Artemisinin						

14.1.1.26. Curcumin					
14.1.1.27. Alliin					
14.1.1.28. Resveratrol					
14.1.1.29. Arjunolic acid					
14.1.1.30. Reserpine, etc.					
14.1.2. Regulatory aspects Phytopharmaceuticals					
• M14U2 Extraction Techniques					
14.2.1. Conventional methods - Description, advantages and limitations.					
14.2.1.1. Cold percolation / maceration					
14.2.1.2. Infusion					
14.2.1.3. Decoction					
14.2.1.4. Refluxing					
14.2.1.5. Digestion					
14.2.1.6. Hydro distillation etc.					
14.2.2. Non - conventional methods - Description, advantages and limitations.					
14.2.2.1. Super critical fluid extraction method					
14.2.2.2. Microwave-assisted extraction (MAE)					
14.2.2.3. Ultrasound-assisted extraction (UAE) or sonication					

	14.2.2.4. Enzyme-assisted extraction 14.2.2.5. Pulsed electric field (PEF) assisted extraction 14.2.2.6. Pressurized liquid extraction (PLE) etc. • M14U3 Separation methods 14.3.1. Physical techniques 14.3.2. Types and Terminologies in Chromatography 14.3.3. High Pressure Liquid Chromatography(HPLC) • M14U4 Instrumental Techniques for Phytopharmaceutical characterization 14.4.1. Infrared Spectroscopy (IR), 14.4.2. UltraViolet -Visible spectroscopy (UV-Vis), 14.4.3. Gas Chromatography - Mass Spectrometry (GC-MS), 14.4.4. Nuclear Magnetic Resonance Spectroscopy (NMR), 14.4.5. Mass Spectroscopy (MS) • M14U5 Computational Docking Techniques 14.5.1. Introduction to <i>in silico</i> docking study 14.5.2. Types and various methods of docking study 14.5.3. Docking software and popular docking tools 14.5.4. Applications of docking in new drug discovery 14.5.5. Applications of chemical drawing software tool and types					
		4	20	40	60	120
Semester No : 6						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including	2G Total

					Modular Assessment	
15	M-15 Herbs used in Siddha Dietetics This module describes <i>Unave marunthu</i>, <i>Marunthe unavu</i> (Food is medicine, Medicine is Food)- Fundamental concepts of herbs used in Siddha Dietetics, role of Nutraceuticals, <i>Mooligaikal</i> used in traditional food recipes in preventing Life style disorders, herbs used in <i>Pathiyam</i> (diet regimen) and Regulations of Food Safety and Standards Authority of India (FSSAI) • M15U1 Food is medicine, Medicine is Food 15.1.1. Fundamental concepts of herbs used in Siddha Dietetics 15.1.2. Classification of Food based on Siddha principles 15.1.3. Herbs used in Traditional Food recipes in preventing Lifestyle disorders 15.1.4. Herbs used in <i>Pathiyam</i> (diet regimen) for diseases and selected medicines 15.1.5. Role & Responsibilities of Food Safety and Standards Authority of India (FSSAI) • M15U2 Unavagum thavarangal (Plants as food) 15.2.1. Siddha aspects and Therapeutic properties of Edible herbs 15.2.1.1. <i>Ver</i> (root) 15.2.1.2. <i>Kizhangu</i> (tuber) 15.2.1.3. <i>Samoolam</i> (Whole plant) 15.2.1.4. <i>Thandu</i> (Stem) 15.2.1.5. <i>Kai</i> (vegetable)	2	10	20	30	60

15.2.1.6. *Kani* (Fruit)

15.2.1.7. *Malar* (Flower)

15.2.1.8. *Keeraigal* (Greens)

15.2.1.9. *Vithaigal* (Seeds and Legumes)

15.2.2. Spices

• **M15U3 Herbal food rich in Antioxidants**

15.3.1. Recommended Dietary Allowance (RDA) and Food exchange list

15.3.2. Organic Foods and Functional foods

15.3.3. Antioxidant rich foods/ Anti aging foods

15.3.4. Fibre rich foods

15.3.5. Scope for the development of food

• **M15U4 Ootachathu Mooligai-Siddha Nutraceuticals**

15.4.1. Study on *Siruthaniyangal* (Millets) and *Navathaniyangal* - Siddha
Pharmacological aspects, Nutritive Values

15.4.1.1. *Siruthanium*

1. *Kuthiraivaali* - *Echinochola frumentacea* 2. *Kambu* - *Pennisetum glaucum* 3.
Kezhvaragu - *Eleusine coracana* 4. *Saamai* - *Panicum sumatrense* 5. *Cholam* -
Sorghum vulgare 6. *Thinai* - *Setaria italica* 7. *Makkacholam* - *Zea mays* 8. *Varagu* -
Paspalum scorbiculatum 9. *Panivaraku* - *Panicum miliaceum* 10. *Seethai Korai* -
Brachiaria ramosa

15.4.1.2. *Navathaniam*

1. *Gothumai* - *Triticum aestivum* 2. *Nellu* - *Oryza sativa* 3. *Ellu* - *Sesamum indicum*
4. *Payaru* - *Vigna radiata* 5. *Kollu* - *Macrotyloma uniflorum* 6. *Ullundu* - *Vigna*
munga 7. *Mochai* - *Lablab purpureus* 8. *Thuvarai* - *Cajanus cajan* 9. *Kondaikadalai*
- *Cicer arietinum*

15.4.2. Status of nutritional food in international scenario

15.4.3. Nutrition and Siddha medicine in lifestyle disorders and various diseases

15.4.4. Role of Fermented foods in promoting Gut health

15.4.5. Nutritive value of Spirulina - *Arthrospira platensis*

• **M15U5 Parambaria Nel (Paddy) and other alternative functional grains**

15.5.1. Siddha aspects of Nel (Paddy) as per *Gunapadam mooligai* text

1. Kaar 2. Manakaththai 3. Vaalaan 4. Karunkuruvai 5. Eerkkuchamba 6. Puzhuguchamba 7. Koraichamba 8. Kurunchamba 9. Milaguchamba 10. Seeraga chamba 11. Kaalan chamba 12. Mai chamba 13. Kodaichamba 14. Kaadaichamba 15. Malligaichamba 16. Iluppaipoo chamba 17. Mani chamba 18. Valaithadichamba 19. Kaivaraichamba 20. Senchamba 21. Kallundai chamba 22. Kunduchamba 23. Kundrimani chamba 24. Annamazhagi

15.5.1.1. Properties of rice

15.5.1.2. Types

15.5.1.3. Porridge varieties

15.5.1.4. *Ner pori* (Puffed rice)

15.5.1.5. Rice flour and its uses

15.5.2. *Parambaria Arisi* (rice) , Medicinal importance of the listed *Arisi*

1. Black kavuni 2. Poongar 3. Sithu kothirai 4. Thuya malli 5. Mapillai samba 6. Kizhavan samba 7. Kaatu yaanam 8. Karudan samba 9. Kuda vaazhai 10. Kodu mani 11. Navara arisi 12. Kichilli samba 13. Sivappu Kavuni 14. Ponni 15. Thanga samba

15.5.2.1 Aromatic Rice Varieties - Basmati rice, Jasmine rice

15.5.3. Other functional alternative grains and their nutritional values

	15.5.3.1. <i>Moongil Arisi</i> (Bamboo Rice) 15.5.3.2. Extraction and preparation of Sago grains (<i>Cycas revoluta</i>) 15.5.3.3. Red Yeast Rice (<i>Monascus purpureus</i>) 15.5.3.4. Quinoa Rice (seeds)- <i>Chenopodium quinoa</i> 15.5.3.5. Pseudocereals - Amaranth, Buckwheat, Chia seeds					
16	M-16 Recent Trends in Plant Based Applications, Drugs and Cosmetics Act and Magic Remedies Act Principles, in Plant -based applications in medical field, synthesis of Nano particles/ Nano cosmetics, Drugs and Cosmetics Act and Magic Remedies Act, Importance and applications of tissue culture. • M16U1 Sustainable Approach to Pigments, Dyes, Flavors, Sweeteners derived from plants 16.1.1. Siddha plant derived eco- friendly dyes in cosmetic industry 16.1.2. Application of plant derived Colorants, Flavors, Sweeteners, Emulsifiers, Preservatives, Essences in food industry 16.1.3. Plant - based ecofriendly alternative fibers and dying in textile industry 16.1.4. Plant - based dyes in pharmaceutical industry 16.1.5. Aromatic oils and their applications • M16U2 Application of Plant Extract in Biomaterials- Bio-implants, Bioplastics, Exosomes and Biofuels 16.2.1. Bio-implants 16.2.1.1. Wound healing materials (Cellulose, Chitosan, Alginate)	2	10	20	30	60

16.2.1.2. Applications in skin grafts, bone regeneration and dental implant 16.2.1.3. Safety and toxicity of bioimplants 16.2.1.4. Future scope of bioimplants 16.2.2. Bioplastics 16.2.3. Introduction to exosomes and extracellular vesicles 16.2.3.1. Plant derived exosomes: extraction and characterisation 16.2.3.2. Composition of exosomes 16.2.3.3. Applications in therapeutics and cosmetics 16.2.3.4. Advantages and limitations in plant exosome research 16.2.4. Biofuels: Bio-butanol, Biodiesel, Biogas, Bioethanol • M16U3 Plant Based Nanotechnology 16.3.1. Nanomedicine 16.3.2. Green Synthesis of Nanoparticles from Siddha Medicinal plants 16.3.2.1. Synthesis of Silver, Gold, Zinc Oxide, Iron Oxide, etc using plants 16.3.2.2. Applications in medicine and targeted drug delivery 16.3.3. Toxicity and biocompatibility of plant - based nanoparticle 16.3.4. Plant - based Nanocosmeceuticals 16.3.5. Plant - based nano pesticides • M16U4 Plant Based Collagen and Biologics 16.4.1. Plant based Collagen 16.4.1.1. Sources of Plant based collagen substitutes - Seaweed, Soy protein, bacterial collagen, plant peptides, legumes, whole grains, citrus fruits, garlic.					
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	16.4.1.2. Uses of vegan collagen 16.4.1.3. Extraction and purification techniques 16.4.1.4. Application in cosmetics 16.4.1.5. Biologics with examples and applications 16.4.1.6. Gene expression in plants with examples and applications • M16U5 Importance and Applications of Tissue Culture 16.5.1. The International Union for Conservation of Nature (IUCN) Red List 16.5.2. Critically endangered, vulnerable & near threatened plants 16.5.3. Plant Tissue culture and its techniques 16.5.3.1. Applications and advantages 16.5.3.2. Challenges and limitations					
		4	20	40	60	120
		16	80	160	240	480
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)						
Semester No : 3						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total

17	M-17 Essentials of inorganic chemistry and analytical chemistry This module provides clear understanding about inorganic chemistry and its application in Siddha system of medicine to unearth unknown facts behind chemical reactions that occurs during medicine preparation process Siddhi process, and Siddha alchemy. • M17U1 Essentials of inorganic chemistry and Basics of Siddha Alchemy 17.1.1. Inorganic chemistry 17.1.2. Basics of Siddha alchemy • M17U2 Fundamentals of Analytical chemistry 17.2.1. Principles of analytical chemistry 17.2.2. Traceability of analytical chemistry 17.2.3. Quantitative and qualitative of analytical processes 17.2.4. Nuclear Magnetic Resonance(NMR) Spectroscopy 17.2.5. Fourier Transform Nuclear Magnetic Resonance (FTNMR) 17.2.6. Glow Emission spectroscopy 17.2.7. Laser Induced breakdown spectroscopy 17.2.8. Atomic florescence spectroscopy • M17U3 Analytical instrumentation for evaluation of metal and mineral drugs 17.3.1. Atomic Absorption Spectroscopy (AAS) 17.3.2. Ultra Violet (UV) spectroscopy 17.3.3. Infra Red (IR) spectroscopy 17.3.4. Raman spectroscopy, Mass spectroscopy 17.3.5. Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-OES) 17.3.6. X Ray Diffraction (XRD) 17.3.7. Energy Dispersive X-Ray Analysis (EDAX) 17.3.8. Dynamic Light Scattering (DLS) 17.3.9. Scanning Electron Microscopy (SEM)	2	10	20	30	60
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	17.3.10. Transmission Electron Microscopy (TEM) 17.3.11. X Ray Fluorescence (XRF)					
18	M-18 Medical Mineralogy and Geology This module gives understanding about mineralogy and helps to identify and authenticate the raw drugs of metal and mineral origin through physical, chemical properties in order to validate the reliability of Siddha medicine. • M18U1 Mineralogy, Crystallography, Geology 18.1.1. Classification of minerals 18.1.2. Physical characters of minerals 18.1.3. Thermal characters of minerals 18.1.4. Descriptive mineralogy 18.1.5. Role of trace element and minerals in health and longevity • M18U2 Examination of Metals / Minerals - Physical and Chemical 18.2.1. Metals / Minerals Examination using physical characters 18.2.2. Chemical examination of metals / minerals 18.2.3. Collection of Metal/ Mineral ore and examination of collected ore 18.2.4. Analysis of drugs of metals and mineral origin and comparative study of AYUSH drugs	2	10	20	30	60
		4	20	40	60	120
Semester No : 4						
2A Module Number	2B Modules & units	2C Number of Credits	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including	2G Total

					Modular Assessment	
19	M-19 Safety Pharmacology of Metals and Mineral Drugs This module clearly illustrates Metals/mineral toxicity and its mechanism of toxicity , Carcinogenicity, Mutagenicity, Eco toxicity, immunotoxicity etc., and helps to predict and prevent the possible adverse drug effects of Siddha medications prepared using metals and minerals. • M19U1 Molecular mechanism of metal toxicity, carcinogenicity 19.1.1. Molecular mechanism of selected metal toxicity and carcinogenicity 19.1.1.1. Iron 19.1.1.2. Zinc 19.1.1.3. Arsenic 19.1.1.4. Lead 19.1.1.5. Cadmium 19.1.1.6. Copper 19.1.1.7. Mercury 19.1.2. Impacts of metal on signal transduction pathway and gene expression • M19U2 Mutagenicity, Genotoxicity, Ecotoxicity and Metal interaction 19.2.1. Mutagenic and genotoxic effects of metals 19.2.2. Eco toxicity, immunotoxicity of metals 19.2.3. Influence of age, Sex other factors on metal toxicity 19.2.4. Influence Alcohol and tobacco on metal mechanism 19.2.5. Metal- Metal interaction, carcinogenic and non-carcinogenic effects 19.2.6. Arsenic,Iron,Lead, Zinc, Mercury, Copper, Potassium, and other metals 19.2.7. Centre for cellular and molecular biology, Institute of Toxicology Research • M19U3 Assessment of Safety Pharmacology of metal and mineral 19.3.1. Limit tests for presence of heavy metals in the given sample 19.3.2. Pharmacovigilance practice in drugs of metal and mineral origin Assessment	2	10	20	30	60

	and reporting of clinical safety pharmacology (Adverse Drug Reactions (ADR) reporting /case series) 19.3.3. Renal toxicity, liver toxicity using Liver Function Test (LFT) and Renal Function Test (RFT)					
20	M-20 Recent advances including applied pharmaceutics This module provides the basics of pharmaceutics including Dosages forms, Drug delivery systems, Drug standardization, Drug discovery and development process. It encourages to do advanced research and application of recent advances in the field of Marunthial(Siddha Pharmacology) furthermore it describes the Metallo-therapeutics uses, mechanism of actions of certain metals and its application in Siddha System of Medicine. Facilitates the basic understanding of pharmacogenomics & Nano Pharmacology and its application in Siddha Medicine. • M20U1 Dosage forms, Delivery system and delivery route including Novel drug delivery system 20.1.1 Various dosage forms and delivery system 20.1.2 Various routes of drug administration and its significance in Siddha System of Medicine • M20U2 Drug Standardization, Drug Discovery and development 20.2.1 Process of drug discovery and development 20.2.2 Developing newer formulations of metals, minerals based on modern and Siddha techniques 20.2.3 Genetic aspects of drug discovery and development, Drug targeting technology 20.2.4 Standardization of metals and mineral drugs - organoleptic characters, macroscopic and microscopic study, physico chemical analysis 20.2.5 Drug discovery and development process • M20U3 Current trends in Metallo-therapeutics	2	10	20	30	60

	20.3.1 Listed elements as Metallo therapeutic agents in following aspects Biological role, Targets, Therapeutic aspects - Lithium, Boron, Magnesium , Aluminium, Organo silicon, Calcium 20.3.2 Listed elements as Metallo therapeutic agents in following aspects Biological role, Targets, Therapeutic aspects - Titanium, Vanadium, Manganese, Cobalt, Gallium, Germanium 20.3.3 Listed elements as Metallo therapeutic agents in following aspects Biological role, Targets, Therapeutic aspects - Selenium, Ruthenium, Rodium, Palladium, Rhenium, Platinum 20.3.4 In-Silico Pharmacokinetics and Pharmacodynamics. • M20U4 Pharmacogenomics and Nano pharmacology and other emerging technologies in pharmacology 20.4.1 Pharmacogenomics and personalised medicine 20.4.2 Nano - technology and Nano materials 20.4.3 Application of Nano metals in pharmacology, Isolation of Nanometals from drugs of animal and Metal origin in Siddha aspects eg <i>Poonaga sathu</i> , Extraction of <i>sembu</i> from <i>Indrakopa poochi</i> , and <i>poonagam</i> 20.4.4 Analysis for presence of Nano metals in Herbal drugs					
		4	20	40	60	120
Semester No : 5						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
21	M-21 Ulogangal and Panchasootham (Metals and Mercurial Compounds)	2	10	20	30	60

This module comprehend about descriptions, general characteristics, Therapeutic uses, Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Various purification methods of metal drugs and Origin, Reason for synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *Pagai sarakku*, Peculiar characteristics, varieties *Nanju kurigunam* and *Murivu*, Scientific aspects of Mercurial compounds.

• M21U1 Transitional Metals - Ayam - Iron, Sembu- Copper, Nagam - Zinc, Velli - Silver and Thangam - Gold

21.1.1. Origin, Reason for Synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *pagai sarakku* (agonist and antagonist), Peculiar characteristics, Varieties, Medicinal uses, *Nanju kurigunam* (toxic symptoms) and *murivu* (antidote), Scientific aspects of following metals

21.1.1.1. *Ayam* - Iron

21.1.1.2. *Sembu* - Copper

21.1.1.3. *Nagam* - Zinc

21.1.1.4. *Velli* - Silver

21.1.1.5. *Thangam* - Gold

21.1.2 Various purification methods

21.1.3 Biological roles

21.1.4 Extraction method of metals from plants using Traditional Methods

21.1.5 Formulations prepared from above said metals

• M21U2 Post Transitional Metals - Vangam - Lead, Mirutharsingi - Galena sulphide, Velvangam - Tin

21.2.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *pakai sarakku* (Agonist and Antagonist), Peculiar characteristic, Medicinal uses, *Nanju kurigunam* (toxic symptoms) and *murivu* (antidote), Scientific aspects of following metals

21.2.1.1 Vangam - Lead

21.2.1.2 Mirutharsingi - Galena sulphide

21.2.1.3 Velvangam - Tin 21.2.2 Extraction of lead from <i>Mirutharsingi</i> 21.2.3 Various purification methods 21.2.4 Biological roles 21.2.5 List out the formulations prepared from above said metals • M21U3 Miscellaneous Metals - Ekku - Steel, Ayanagam - Iron Zinc Alloy, Mandooram - Iron Oxide, Kaantham - Magnetite 21.3.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being <i>Natpu sarakku</i> and <i>pakai sarakku</i> (agonist and antagonist), Peculiar characteristic, Varieties, Medicinal uses, <i>Nanju kurigunam</i> (Toxic symptoms) and <i>murivu</i> (antidote), Scientific aspects of following metal 21.3.1.1 <i>Ekku</i> - Steel 21.3.1.2 <i>Ayanagam</i> - Iron zinc alloy 21.3.1.3 <i>Kaantham</i> - Magnetite 21.3.1.4 <i>Mandooram</i> - Iron oxide 21.3.2 Biological roles 21.3.3 Traditional testing method for purified <i>kaantham</i>. 21.3.4 Formulations prepared from above said metals 21.3.5 Meta-analysis of recent research • M21U4 Panchasootham- Mercury and Mercurial compounds 21.4.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being <i>Natpu sarakku</i> and <i>pagai sarakku</i> (agonist and antagonist), Peculiar characteristics, Varieties, <i>Nanju kurigunam</i> (Toxic symptoms) and <i>murivu</i> (antidote), Medicinal uses, Scientific aspects of following 21.4.1.1 <i>Rasam</i> - Mercury 21.4.1.2 <i>Rasa chendooram</i> - Redsulphide of Mercury 21.4.1.3 <i>Lingam</i> - Cinnabar 21.4.1.4 <i>Pooram</i> - Mercuric sub chloride 21.4.1.5 <i>Veeram</i> - Mercuric per chloride 21.4.2 Vaippu muraikal 21.4.3 Various purification Techniques					
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	21.4.4 Biological roles 21.4.5 Organo mercurial compounds 21.4.6 Formulations 21.4.7 Meta-analysis of recent research 21.4.8 National metallurgic laboratory, Central drug research institute, Geological survey of India, Institute of minerals and material technology 21.4.9 Extraction methods					
22	M-22 Paadanankal and Karasaram (Arsenic Compounds and Salts,Alkalies) This module enlightens knowledge in descriptions, General characteristics, Therapeutic uses, Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Various purification methods of mineral drugs • M22U1 Gandhagam (Sulphur), Anjanakal (Antimony) 22.1.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being <i>Natpu sarakku</i> and <i>pagai sarakku</i> (agonist and antagonist), Peculiar characteristic, Varieties, Medicinal uses, <i>Nanju kurigunam</i> (Toxic symptoms) and <i>murivu</i> (antidote), scientific aspects of following 22.1.1.1 <i>Gandhagam</i> (Sulphur) 22.1.1.2 <i>Anjanakal</i> (Antimony) 22.1.2. Vaippu muraikal 22.1.3. Various purification Techniques 22.1.4. Biological roles 22.1.5. Formulations 22.1.6 Meta-analysis of recent research • M22U2 Gowri paadanam (Arsenic compound),Vellai paadanam (Arsenium Acidum),Thalagam(Arsenic Tri Sulphidum),Manosilai(Arsenic Di Sulphidum),Kuthiraipal paadanam (Feldspar) 22.2.1. Origin, Reason for Synonyms, Organoleptic characters, Reason for being	2	10	20	30	60

Natpu sarakku and *pagai sarakku* (agonist and antagonist), Peculiar characteristic, Varieties, Medicinal uses, *Nanju kurigunam* (Toxic symptoms) and *murivu* (antidote), scientific aspects of following

22.2.1.1 *Gowri Paadanam* - Yellow oxide of arsenic

22.2.1.2 *Vellai paadanam* - White arsenic

22.2.1.3 *Thalagam* - Yellow arsenic

22.2.1.4 *Manosilai* - Realger

22.2.1.5 *Kuthiraipal paadanam* - orthoclase

22.2.2. Vaippu muraikal

22.2.3. Various purification Techniques

22.2.4. Biological roles

22.2.5. Formulations

22.2.6. Meta-analysis of recent research

• **M22U3 Alkaline metals and alkaline earth materials**

22.3.1. Role of Sodium and potassium in Health, Sodium potassium pump

22.3.2. Role of *Chunna sathu* (calcium) in medicine

22.3.3. Muscle contraction and relaxation experiments using drugs that contains sodium and calcium ole of Sodium and potassium in Health, Sodium potassium pump

• **M22U4 Karasaram- salts and alkalies**

(Sources, Reason for synonyms, Organoleptic characters, Peculiar characteristics, Medicinal uses, Scientific aspects of following)

22.4.1. *Appalakaram* - Sodium Bicarbonate

22.4.2. *Yavatcharam* - Potassium carbonate

22.4.3. *Sathicharam* - Bentonite clay

22.4.4. *Savukaaram* - Hydrous sodium carbonate

22.4.5. *Seenakkaram*- Potash Alum

22.4.6. *Navatcharam* - Ammonium chloride

22.4.7. *Vangaala patchai* - Sub acetate of Copper

22.4.8. *Soodan* - Camphor

22.4.9. *Pachaikarpooram* - Borneo Camphor

• **M22U5 Uppukal(Salts)**

	(Origin, Reason for synonyms, Organoleptic characters, Peculiar characteristics, Medicinal uses, Scientific aspects of following) 22.5.1. <i>Indhuppu</i> - Rock Salt 22.5.2. <i>Attuppu</i> - Extracted salt from salt petre 22.4.3. <i>Kallupu</i> - Marine phosphorities 22.4.4. <i>Kariuppu</i> - Sodium chloride 22.4.5. <i>Savuttuppu</i> - Extracted salt from pooneru 22.4.6. <i>Pooneru</i> - Fuller's Earth 22.4.7. <i>Vediuppu</i> - Potassium nitrate 22.4.8. <i>Venkaram</i> - Borax 22.4.9. <i>Pidalavanam</i> - Black Salt 22.4.10. <i>Kanthilavanam</i> -Sodium sulphate 22.4.11. <i>Ambar</i> - Ambra Garasea					
		4	20	40	60	120
Semester No : 6						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
23	M-23 Uparasam and Navamanikal (Mineral substance and Gems) Jeeva Vaguppu – Part I (Drugs of Marine origin and Animal by products) This module provides knowledge in descriptions, General characteristics, Therapeutic uses, Biological roles, pharmacokinetics, Mechanism of action	2	10	20	30	60

activity on enzyme, Target organs, Various purification methods of *Uparasam* and *Navamanigal*, *Jeeva porutkal* part I and its Clinical Importance.

• M23U1 Uparasam

Origin, Reason for synonyms if any, Organoleptic characters, Peculiar characteristics, Varieties if any, Scientific aspects of following

23.1.1 *Abragam* (Biotite Mica)

23.1.2 *Annabethi* (Green vitriol - Ferrous sulphate)

23.1.3 *Karpoorasilasathu* (Asphalt)

23.1.4 *Koomoothirasilasathu* (Gypsum)

23.1.5 *Kalnaar* (Asbestos)

23.1.6 *Karchunnambu* (Calcium carbonate)

23.1.7 *Kadikaaram* (Nitrate of Silver)

23.1.8 *Kavikal* (Red Ochre)

23.1.9 *Thurusu* (Copper sulphate)

23.1.10 *Nandukal* (Fossil Stone Crab)

23.1.11 *Nimilai* (Chalcopyrite)

23.1.12 *Palthutham* (Sulphate of Zinc)

23.1.13 *Karudakal* (Magnesite)

23.1.14 *Padigakal*, *Rasavarthakal*, *Karungal*, *Vellaikal*, *Kurunthakal*, *Sittakkal*, *Sukkangal*, *Sengal*, *Manjalkal*, *Maakgal*, *Mangishabedhi*,

23.1.15 *Manal*, *Karumanal*, *Uvarman*

• M23U2 Navamanigal (Gems)

Origin, Reason for synonyms if any, Organoleptic characters, Peculiar characteristics, Varieties if any, Scientific aspects of following

23.2.1 *Navamanigal* and its importance

23.2.1.1 *Muthu* (Pearl)

23.2.1.2 *Pavalam* (Red coral)

23.2.1.3 *Komethagam* (Hessonite)

23.2.1.4 *Neelamani* (Blue sapphire)

23.2.1.5 *Pushparagam* (Yellow sapphire)

23.2.1.6 *Maragatham* (Emerald)

23.2.1.7 *Manickkam* (Ruby)

23.2.1.8 *Vaituriyam* (Cats eye)

23.2.1.9 *Vairam* (Diamond)

23.2.2 Various purification Techniques

• **M23U3 Jeeva Vaguppu Part - I**

23.3.1 Anthropods

Describe Verupeyarkal (synonyms), zoological name, distribution, Pothugunam and sutthi(general characteristics and purification), Zoological aspects, Therapeutic uses, Name of the formulation pertaining to this drug, Mechanism of action (if available) of following

1. Karu vandu (Black Beetle – *Heteronychus arator*)
2. Kazhuthaivandu (Mupli beetle - *Luprops tristis*)
3. Naakara vandu (Wood-boring beetle - *Agrilus planipennis*)
4. Erivandu (Blister beetle - *Mylabris* sp.)
5. Minmini poochi (Firefly - *Photinus* sp.)
6. Indhirakoba Poochi (Red Velvet Mites - *Trombidium Grandissimum*)

23.3.2 Avians

Zoological aspects , Therapeutic uses, Name of the formulation above said drug, Mechanism of action if available of following

1. Aaalkatti patchi (Red wattled lapwing - *Vanellus indicus*)
2. Kozhi (Domestic cock & hen - *Gallus domesticus*)
3. Kuruvi (House sparrow- *Passer domesticus*)
4. Mayil (Indian Peafowl - *Pavo cristatus*)
5. Vovaal (Indian fruit eating bat - *Pteropus giganteus*)

23.3.3 Reptiles

Veruperyarkal (synonyms), zoological name, vaazhidam (habitat), Pothugunam (General characteristics), Varieties and sutthi (purification) of following, Clinical importance (if available)

1. Attai (Speckled leech - *Hirudo Medicinalis*)
2. Amai (Turtle - *Chelonia* sp.)
3. Oonan (Oriental Garden Lizard- *Calotes pethiyagodai*)
4. Udumbu (Common Indian monitor - *Varanus* sp.)

	5. Nathai (Common garden Snail - Phylum: Mollusca) 6. Paambu (Snakes - Serpentes sub family) 7. Poonagam (Earthworm - Lumbricus sp.) 8. Erumbu (Ants - Formicidae) 9. Muthalai (Crocodile - Crocodylus palustris) 10. Mull eli (Thorny rat -n Hedgehog - Erinaceus europaeus) 23.3.4 Mammals Verupeyarkal (synonyms), zoological name, distribution, Pothugunam (general characteristics), Current trends and recent research updates of following 1. Yaanai, Kuzhiyaanai, (Asian Elephant - Elephas maximus/ Antilon Insect- Myrmeleon sp) 2. Karadi (Sloth Bear- Melursus ursinus) 3. Maan (Deer - Cervidae) 4. Kaandamirukam (Indian rhinoceros - Rhinoceros unicornis) 5. Puli (Tiger - Panthera tigris) 6. Poonai (Asian palm civet - Paradoxurus hermaphroditus) 7. Muyal (Rabbit- Oryctolagus cuniculus) 8. Pandri, Pandri mul (Pig -Sus domesticus)					
24	M-24 Jeeva Vaguppu Part - II (Drugs of Marine Origin and Animal by Products) This module provides clear understanding about Marine biology , Taxonomy of Animals, Marine Medicinal Chemistry and application of Marine and Animal products in Nutraceuticals and helps to understand General Characters, Therapeutic uses, Analytical methods for validation of quality, Biological roles of Animal By-Products • M24U1 Introduction to Biology, Nomenclature, Taxonomy 24.1.1 Animal kingdom 24.1.2 Marine kingdom - Molluscs, Fishes	2	10	20	30	60

• **M24U2 Marine Medicinal Chemistry**

24.2.1 Nutritional aspects of various types of fishes, Health effects of fish proteins and other Marines products

24.2.2 Role of Fish Skin in Wound Healing (Burns, Diabetic Ulcers, and Non-Healing Ulcers)

24.2.3 Marine peptide and proteins (Lectin, collagen, elastin, chitin, chaetocin, glucosamine, chondroitin sulfates, and antimicrobial peptide present in molluscs)

24.2.4 Marine sources of Vitamins and minerals in health

• **M24U3 Evaluation And Analysis Of Animal By-Products**

24.3.1 Adulteration in animal bi - products - Analysis of Milk

24.3.1.1 Detection of adulteration in milk

24.3.1.2 Detection of foreign fat in milk

24.3.1.3 Detection of formalin in milk

24.3.2 Adulteration in animal by products - Analysis of Curd

24.3.2.1 Presence of starch

24.3.3 Adulteration in animal by products - Analysis of Butter & Ghee

24.3.3.1 Test for detection of Vanaspati in ghee

24.3.3.2 Test for detection of mineral oil in ghee

24.3.3.3 Perform Analysis of Honey, bees wax

24.3.4 Adulteration in animal by products - Analysis of Honey

24.3.4.1 Determination of total reducing sugar sucrose and fructose- glucose ratio

24.3.4.2 Determination of pollens and plant element in honey

24.3.5. Adulteration in animal by products - Analysis of Bees wax

24.3.5.1 Determination of melting points

24.3.5.2 Determination of carnauba wax

24.3.5.3 Determination of paraffin in other wax

24.3.6. Methods of analysis of Meat & fish products

24.3.6.1 Govt food analysis laboratory / Central Food technological research institute

• **M24U4 Jeeva vaguppu part – II**

24.4.1 Aquatic Animals and Animal - Products

Verupeyarkal(synonyms), zoological name, distribution, Pothugunam(general

characteristics), Zoological aspects ,Therapeutic uses, Name of the formulation pertaining to this drug, Current trends and recent research updates in drugs of animal and marine origin(Mechanism of action if available) of following

24.4.1.1 Aquatic Animals

1. Aamai (Turtle - *Chelonia* sp)
2. Sura (Milk Shark - *Carcharhinus hemiodon*)
3. Nandu (Crab - Indian rice field crab - *Oziotelphusa*)

24.4.1.2 Animal By - Products

1. *Irakugal* (Feathers of birds)
2. *Elumbugal* (Bones)
3. *Kasthuri* (Musk - *Moschus moschiferus*)
4. *Kombugal* (Horns)
5. *Kilinjai* (Common oyster shell)
6. *Kulambugal* (Hoofs)
7. *Kulavikoodu* (Wasp nest - *Vespula* sp.)
8. *Kombaraku* (Lac- *Laccifer Lacca*)
9. *Korosani* (Purified ox bile/ ox gall - *Felbovinum purifactum*)
10. *Sangu* (Conch shell - *Turbinellarapa*)
11. *Saanam* (Dung)
12. *Siruneer* (Urine)
13. *Thantham* (Teeth)
14. *Thaen* (Honey)
15. *Nari Ettcham* (Fox - *Vulpes* sp)
16. *Palagarai* (Cowry - *Cypraea moneta* Linn)
17. *Pambusattai* (Snake skin- *Naja naja*)
18. *Palum Pal Porutkalum* (Milk & Milk Products)
19. *Pitchi* (Bile)
20. *Pura Ettcham* (Pigeon excrement)
21. *Punugu* (Civet Cat - *Viverra civetta*)
22. *Musuru Muttai* (Egg of *Formica smaragdina*)
23. *Muttai Oodu* (Egg Shell)

	24. <i>Muthuchippi</i> (Pearl Oyster Shell - <i>Mytilusmargaritiferus</i>) 25. <i>Mezhugu</i> (Wax) 26. <i>Meen Elumbu</i> (Fish Bone) 27. <i>Viraal Meen Thalai Kal</i> (Snakehead Murrel Fish- <i>Channastrata</i>) 28. <i>Putransooru</i> (Termite mound on Rice fields - <i>Isoptera</i>) 29. <i>Silanthivalai Nool</i> (Web of cobweb spiders (family <i>Theridiidae</i>) 30. <i>Kadal Nurai</i> (Sea froth)					
		4	20	40	60	120
		16	80	160	240	480
Paper No : 4 (Essentials of Pharmacology)						
Semester No : 3						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
25	M-25 General Pharmacology This module educates the students about the basic principles of Pharmacology including Pharmacokinetics, Pharmacodynamics, factors modifying drug action, Pharmacovigilance for monitoring adverse drug reactions and reporting of adverse drug reactions	2	10	20	30	60

	• M25U1 Introduction to Pharmacology 25.1.1 Definition 25.1.2 Source of drugs 25.1.3 Drug nomenclature 25.1.4 Dosage forms of drugs 25.1.5 Routes of drug administration 25.1.6 Novel drug delivery systems • M25U2 Pharmacokinetics 25.2.1. Membrane transport 25.2.2. Absorption 25.2.3. Distribution 25.2.4. Metabolism and Excretion of drugs 25.2.5. Kinetics of elimination 25.2.6. Bioavailability/Bioequivalence (BA/BE) studies • M25U3 Pharmacodynamics 25.3.1. Principles of drug action 25.3.2. Mechanism of drug action 25.3.3. Receptor Pharmacology 25.3.4. Dose-response relationship 25.3.5. Drug synergism and antagonism • M25U4 Adverse drug effects 25.4.1. Drug toxicity 25.4.2. Hypersensitivity 25.4.3. Idiosyncrasy 25.4.4. Tolerance 25.4.5. Dependence 25.4.6. Teratogenicity 25.4.7. Mutagenicity and Carcinogenicity 25.4.8. Pharmacovigilance					
26	M-26 Drug Development Process	2	10	20	30	60

	This module educates the students about the new drug development process from various sources, reverse Pharmacology, experimental animals in preclinical research and regulatory guidelines for the ethical considerations of biomedical research in animals, toxicity studies and drug development process • M26U1 Methods of Drug discovery 26.1.1. New Drug development process 26.1.2. Preclinical trial Acute, subacute, chronic toxicity and therapeutic index studies 26.1.3. Clinical trials : Phases of clinical trials and their methodology 26.1.4. Regulatory approval and Drug development regulations: OECD guidelines for acute, repeated dose toxicity, dermal toxicity. WHO guidelines for evaluating the safety and efficacy of herbal medicines and CCRAS guidelines of Drug Development • M26U2 Reverse Pharmacology 26.2.1. Natural Products as Traditional Drugs 26.2.2. Reverse Pharmacology in Drug Discovery: Hits and Leads from Traditional Drugs for Drug Discovery, Methodology and advantages • M26U3 Experimental animals in Preclinical research 26.3.1. Common laboratory animals, Advantages and disadvantages of animals experimentation 26.3.2. Ethical considerations: Ethical approval, applicable regulatory Guidelines (CCSEA), humane animal research (principles of 3Rs) and alternatives to animal experimentation 26.3.3. Anaesthetics used in animal research and chemical euthanasia • M26U4 Drug development during Pandemic 26.4.1. Stages in drug development during pandemic 26.4.2. Drug repurposing and conduct of clinical trial during pandemic					
		4	20	40	60	120

Semester No : 4						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
27	M-27 Systemic Pharmacology and Screening methods of Central Nervous System(CNS), Respiratory and Renal Drugs This module educates the students about the classification, mechanism of action, pharmacological action, therapeutic uses, adverse effects of drugs acting on Central nervous system, Respiratory, renal system and their screening methods for scientific validation of efficacy • M27U1 Drugs acting on Central nervous system 27.1.1. Central neurotransmitters 27.1.2. Sedatives and hypnotics – anti anxiety drugs 27.1.3. Antiepileptics 27.1.4. General Anesthetics 27.1.5. Alcohols 27.1.6. Anti psychotics 27.1.7. Anti depressants 27.1.8. Opioid analgesics 27.1.9. Drugs used in neuro degenerative disorders • M27U2 Preclinical Screening	2	10	20	30	60

	27.2.1. Preclinical screening of new substances for the pharmacological activity using in vivo animal models. 27.2.1.1. Behavioral studies and muscle co ordination 27.2.1.2. CNS stimulants and depressants 27.2.1.3. Anxiolytics, anti-psychotics, anti epileptics and nootropics. 27.2.1.4. Drugs for neurodegenerative diseases • M27U3 Drugs acting on Kidney and Respiratory System 27.3.1. Renal Physiology, Diuretics and Anti Diuretics 27.3.2. Respiratory system Drugs • M27U4 Preclinical screening 27.4.1. Preclinical screening of new substances for the pharmacological activity using in vivo animal models. 27.4.1.1. Respiratory Pharmacology: antiasthmatics, drugs for COPD. 27.4.1.2. Renal Pharmacology: Diuretics and Anti-Urolithiasis. 27.4.1.3. Reproductive Pharmacology: Aphrodisiacs and antifertility agents					
28	M-28 Systemic Pharmacology and Screening methods of Autonomic Nervous System (ANS) and Cardiovascular System (CVS) Drugs This module educates the students about the classification, mechanism of action, pharmacological action, therapeutic uses adverse effects of drugs acting on Autonomous nervous system, Cardiovascular system and their screening methods for scientific validation of efficacy	2	10	20	30	60

	• M28U1 Autonomic Nervous System 28.1.1. General Consideration, of Autonomic nervous system 28.1.2. Adrenergic agonist 28.1.3. Adrenergic antagonists, 28.1.4. Cholinergic agonists, 28.1.5. Anticholinesterases drugs 28.1.6. Anticholinergic drugs, Skeletal muscle relaxant • M28U2 Cardiovascular Drugs 28.2.1. Cardiac physiology 28.2.2. Drugs used in Myocardial ischemia 28.2.3. Drugs used in Congestive Cardiac Failure (CCF) 28.2.4. Anti-Hypertensive dugs 28.2.5. Antiarrhythmic drugs 28.2.6. Drugs for Hypercholesterolemia • M28U3 Preclinical Screening 28.3.1. Preclinical screening of new substances for the pharmacological activity using in vivo animal models. 28.3.1.1. Cardiovascular Pharmacology:antihypertensives 28.3.1.2. Antiarrhythmics 28.3.1.3. Antianginal and antiatherosclerotic agents • M28U4 In vitro experimentation 28.4.1. Advantages and disadvantages of in vitro experimentation 28.4.2. Animal cell-culture techniques, cell counting and cell viability assays.					
		4	20	40	60	120
Semester No : 5						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi	Notional Learning hours			

		ts	2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
29	M-29 Systemic Pharmacology and Screening methods of Autacoids and Gastrointestinal Tract(GIT) Drugs This module educates the students about the classification, mechanism of action, pharmacological action, therapeutic uses adverse effects of drugs acting on autacoids and gastrointestinal system and their screening methods for scientific validation of efficacy • M29U1 Gastrointestinal System 29.1.1. Antiemetics 29.1.2. Drugs for peptic ulcer 29.1.3. Anti-diarrheal agents, Laxatives & purgatives • M29U2 Preclinical screening 29.2.1. Preclinical screening methods for Gastrointestinal drugs 29.2.1.1. Anti ulcer 29.2.1.2. Anti -emetic 29.2.1.3. Antidiarrheal and laxatives • M29U3 Autacoids and Related drugs 29.3.1. Histamine and antihistamines 29.3.2. NSAIDS, Anti rheumatoid- anti-gout and immunomodulatory agents	2	10	20	30	60

	29.3.3. Preclinical screening methods for Analgesics, antiinflammatory and antipyretic agents.					
30	M-30 Systemic Pharmacology and Screening methods of Drugs acting on Hormones and blood forming agents This module educates the students about the classification, mechanism of action, pharmacological action, therapeutic uses adverse effects of drugs acting on hormones, blood and blood forming agents and their screening methods for scientific validation of efficacy • M30U1 Drugs acting on Hormones 30.1.1. Insulin, Oral hypoglycemic agents 30.1.2. Thyroxine & Antithyroid drugs 30.1.3. Estrogens and Antagonists 30.1.4. Progestins and Antagonists, Oral Contraceptives, Testosterone and Anabolic steroids • M30U2 Drugs affecting blood and blood formation 30.2.1. Anemia- iron deficiency 30.2.2. Coagulants and anti coagulants 30.2.3. Antiplatelets, antithrombotic and fibrinolytic drugs • M30U3 Screening Methods 30.3.1. Screening methods of Drugs for metabolic disorders like anti-diabetic agents. 30.3.2. Screening of Anti cancer agents 30.3.3. Hepatoprotective screening methods • M30U4 Screening methods 30.4.1. Drug screening methods used in screening of 30.4.1.1. Antifungal agents 30.4.1.2. Antibacterial drugs	2	10	20	30	60

	30.4.1.3. Antiviral agents					
		4	20	40	60	120
Semester No : 6						
2A Modu le Nu mber	2B Modules & units	2C Num ber of Credi ts	Notional Learning hours			
			2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
31	M-31 Anti-microbials and Clinical Pharmacology This module educates the students about the classification, mechanism of action, pharmacological action, therapeutic uses adverse effects of anti microbials and to design and conduct evaluation of a given drug for various phases of clinical trials • M31U1 General principles of antimicrobial therapy 31.1.1. Anti-tubercular drugs 31.1.2. Anti-leprotic drugs 31.1.3. Antimalarial drugs 31.1.4. Drugs for Urinary tract infection 31.1.5. Antifungal drugs 31.1.6. Antiviral drugs 31.1.7. Antiprotozoal drugs 31.1.8. Anticancer drugs • M31U2 Clinical trials	2	10	20	30	60

	31.2.1. Phases of clinical trial – their purpose and methodology. 31.2.2. Good Clinical Practice (GCP) 31.2.3. Protocol designing, placebos, Ethical aspects of clinical trials • M31U3 Drug regulatory requirements 31.3.1. Drug regulatory requirements for clinical trials in India 31.3.2. Drugs and Cosmetic act 31.3.3. The New Drugs and Clinical Trials Rules, 2019.					
32	M-32 Recent advances in Pharmacology This module educates the students about the role of network pharmacology in drug development, pharmacogenomics in inter individual variation, susceptibility to diseases and role of free radicals in diseases and therapy • M32U1 Introduction to Network Pharmacology 32.1.1. Challenges in traditional drug discovery approaches 32.1.2. Principles of Network Pharmacology, significance of multi-component and multi-target interaction • M32U2 Pharmacogenomics 32.2.1. Personalized medicine and precision medicine 32.2.2. Inter individual differences in therapeutic response to drugs, susceptibility to adverse effects 32.2.3. Polymorphism of drug metabolizing enzymes • M32U3 Free radicals Pharmacology 32.3.1. Generation of free radicals 32.3.2. Role of free radicals in diabetes, neurodegenerative diseases and cancer. 32.3.3 Protective activity of certain important antioxidants	2	10	20	30	60
		4	20	40	60	120
		16	80	160	240	480

		64	320	640	960	1920
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Table 3 : Modules - Unit - Module Learning Objectives and Session Learning Objective- Notional Learning Hours- Domain-Level- TL Methods

Paper No : 1 Medicinal Botany and Phytopharmacognosy						
Semester No : 3						
3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/ Experientia l Learning	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/ Knows h ow/Kno w)	3G Teachin g Learnin g Methods
Module 1 : Basics of Pharmacognosy						
Module Learning Objectives (At the end of the module, the students should be able to)						
Describe the role of Traditional Medicine, Ethnobotany and Ethnopharmacology, in drug discovery program Conduct Scientific evaluation and documentation of Ethnobotanical knowledge Identify the challenges in Traditional Indian system of medicine and to find solution						
M 1 Unit 1 Introduction						
1.1.1 Introduction to Medicinal Botany and Phytopharmacognosy. 1.1.2 History of Pharmacognosy and Medicinal Botany 1.1.3 Application of Medicinal Botany in Traditional Indian Medicines (TIM)						
References: 55,88,118,119,136,137,138,248						

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the importance of Medicinal Plants and phytopharmacognosy in Human Health Care.	2	Lecture	CC	Knows-how	L,L&PPT
CO2	Conduct a historical review of Medicinal Plants and analyse the list of Medicinal plants used in various Traditional Indian Medicine.	6	Experiential-Learning 1.1	CAP	Shows-how	FV,TBL, EDU

M 1 Unit 2 Traditional Medicines

1.2.1 Traditional and complimentary Medicines around the Globe 1.2.2 Indian System of Medicines– Siddha, Ayurveda, Unani and Sowa-Rigpa 1.2.3 WHO status of Traditional Medicine

References: 30,47,48,49,63,64,88,90,93,96,136,140,197,217,251,257,260

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the WHO status on Traditional Medical system.	2	Lecture	CC	Knows-how	L&PPT
CO2	Conduct a review on the practice of Traditional medicines around the Globe. Identify the different methods of treatments and herbs utilised in various systems of AYUSH.	6	Experiential-Learning 1.2	CC	Does	ML,FV

M 1 Unit 3 Ethno-Botany

1.3.1 History of Ethnobotany.
1.3.2 Ethnic tribes of India and their Medicines with special reference to Tamilnadu, Kerala, Karnataka and Andhra Pradesh
1.3.3 Geographical location of Important Indian Medicinal plants
1.3.4 Methods in Ethnobotany. Ethnomedicinal plants of different communities.

References: 49,90,93,94,105,106,107

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the role of Ethnic people and their knowledge in drug discovery program. Demonstrate the geographical locations and availability of Medicinal plants used by the ethnic tribes	2	Lecture	CC	Knows-how	L&PPT ,L_VC
CO2	Analyse the Ethnobotanical knowledge of Medicinal Plants	10	Practical Training 1.1	CAN	Shows-how	DIS,FV
CO2	Review a Cross-cultural study about the use of medicinal plants among various ethnic tribes in Tamilnadu and India	6	Experiential-Learning 1.3	CAN	Does	LS,FV

M 1 Unit 4 Ethnopharmacology

- 1.4.1 Ethnopharmacology as a source for drug development.
- 1.4.2 Screening techniques for Herbal Lead Compound.
- 1.4.3 Drugs derived through Ethnopharmacology

References: 3,40,55,75,76,92,96

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the Ethnopharmacological screening techniques to evaluate the Ethnobotanical knowledge	2	Lecture	CC	Knows-how	L&PPT
CO2	Analyse the evaluation methods in Ethnopharmacology	4	Experiential-Learning 1.4	CAN	Shows-how	FV,DIS, ML,SDL, IBL

M 1 Unit 5 Conservation of Medicinal plants

- 1.5.1 Conventional Propagation Methods for Medicinal Plants.
- 1.5.2 Biodiversity conservation of Medicinal Plants

1.5.3 Sacred Groves and their importance in conservation of Medicinal plants

References: 35,198,268,269,270

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the conventional methods of Conservation of Medicinal Plants by various propagation techniques like cutting, layering, grafting and hybridisation methods.	2	Lecture	CC	Knows-how	L_VC,L&PPT
CO2	Construct a Quadrat and observe the number of Medicinal plants in a specific area	10	Practical Training 1.2	PSY-GUD	Shows-how	FV,DG
CO2	Appraise the Biodiversity Conservation method for sustainable utilization of Medicinal Plants	4	Experiential-Learning 1.5	AFT-CHR	Does	DIS,DG,FV

Practical Training Activity

Practical Training 1.1 : Ethnobotany

Total Hours: 10

Field Survey of Ethnobotanical plants from various ethnic tribal habitats in Tamil Nadu. The teacher should demonstrate the method of collection of ethnobotanical data and analysis of the the same.

Survey to be carried out among 2 Ethnic communities.on a specific content. 2x5= 10 Hours

Step 1. Survey and documentation 4 hours

Step 2. Presentation in the class. 1 Hour.

Practical Training 1.2 : Biodiversity Quadrat Analysis

Total Hours 10 Hours

Population density study by Quadrat method to record the abundance of Medicinal plants in a particular area. The teacher should demonstrates the method of constructing a quadrat and to tabulation of plant frequency.

Quadrat Analysis can be done on different habitats viz., a grass land, scrub jungle, dense forest, coastal area, semi aquatic habitats, marsh lands etc. to find the density and frequency of occurrence of medicinal plant species.

At any two Habitats mentioned above. 2x 5 = 10 Hours.

Step 1. Procedure and Demonstration of quadrat Analysis by the Teacher. 1 Hour
 Step 2. Students shall go to the area where quadrat analysis to be done with necessary equipments. 1 Hour
 Step 3. Construction of Quadrat and recording of species. 1 Hour
 Step 4. Repeat the quadrat at least 2 times in the nearby localality. 2 Hours.

Experiential learning Activity

Experiential-Learning 1.1 : Ethnobotany

Total Hours: 6 Hours
 Survey the literature to find the use of Herbal drugs in Traditional Medicine by referring Traditional Knowledge Digital Library (TKDL) website
 Step 1. Each student shall be assigned with a topic to explore and survey the literature of Medicinal plants used by the different ethnic communities of a particular state in India. 3 Hours
 Step 2. Analyse the data and Interpretation of results. 3 Hours.

Experiential-Learning 1.2 : Traditional Medicines

Total Hours: 6 Hours
 Explore the different Traditional medical systems of the world and Ayush systems through Online Databases, Literature Review and Library.
 Step 1. Each student shall approach AYUSH practioners across the state/nation to explore the methods and Herbs used in different Indian Systems of Medicines like Ayurveda, Yoga & Naturopathy, Unani, and Homoeopathy. 5 Hours
 Step 2. Record the information in Log book. 1 Hour.

Experiential-Learning 1.3 : Cross-Cultural study

Total Hours: 6 Hours
 Documentation of various aspects of medicinal plants used by the different Ethnic Communities of our country
 Step 1. A set of two or three groups of students shall undergo a literature review on different Ethnic Communities of Tamil Nadu/India 4 Hours
 Step 2. A cross-cultural study can be made on the data to find the use of Medicinal plants for various ailments. 2 Hours.

Experiential-Learning 1.4 : Ethnopharmacology

Total Hours: 4 Hours
 Explore the Ethnopharmacological screenig techniques in Laboratories
 Step 1. Students should visit the nearby Ethnopharmacological department to know the screening methods of Ethnobotanical knowledge. 3 Hours

Step 2. Record the details in Log book . 1 Hour.

Experiential-Learning 1.5 : Biodiversity Conservation of Medicinal plants

Total Hours: 4 Hours

Collect data of the Medicinal plants in Biodiversity Hot spots.

Step 1. Students should visit to the nearest Forest Department to collect data of Medicinal plants, their status of conservation, Endemism, etc. 3 Hours

Step 2.. Record the details in Log book. 1 Hour.

Modular Assessment

Assessment method

Hour

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Choose any of the below assessments for 50 marks.

1. Theory structured Viva. 20 Marks

i) Prepare 10 viva questions from all the units. Each viva question has 2 marks.

ii) Prepare the key points that need to be covered and marks to be allocated for the key points.

(Ask direct questions to assess the knowledge and recall informations on Ethnobotanical and Ethnopharmacological knowledge.)

2. Mini Project 20 Marks

i) Evaluate the student's ability in interpreting and analysing ethnobotanical data.

ii) Questions based on problem solving on Ethnobotanical scenario.

3. Two Short Answer Questions from units 4 and 5. 2 x 5 =10 Marks.

Or

Any practical in converted form can be taken for Assessment. (25 Marks)

And

Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks).

4

3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/	3G Teachin g Learnin
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			Experientia l Learning		Knows h ow/Kno w)	g Methods
Module 2 : Herbal Raw Materials						
Module Learning Objectives (At the end of the module, the students should be able to)						
Identify the Herbal Trade Markets and communicate with the traders with precise knowledge about herbal drugs Describe the uses of Herbals in the allied fields. Analyse Herbal drug market on their own and supply Raw herbal material to the industry by cultivation methods and become an Entrepreneur.						
M 2 Unit 1 Root, Rhizome, Stem, Wood and Bark drugs						
2.1.1 Pharmacognostical aspects (Morphology, Organoleptic and Anatomical characters) of medicinally useful Roots, Rhizomes, Stem, Wood and bark drugs						
References: 86,87,88,105,106,109,118,137,141,163,186,187,197,217,218,219,220,221,222,223,224,225,227,228,248,260,267						
3A	3B	3C	3D	3E	3F	3G
CO3	Describe the Morphological, Organoleptic and Anatomical characters of the Root, Rhizome, Stem, Wood and Bark drugs used in Siddha Medicine.	2	Lecture	CAP	Knows-how	L&PPT, L&GD
CO2	Investigate the Morphological and organoleptical characters of Medicinal plant parts like roots, rhizomes, stem, wood and bark drugs	8	Practical Training 2.1	CAP	Shows-how	PBL
M 2 Unit 2 Leaf, Flower, Fruit and Seed Drugs						
2.2.1 Pharmacognostical aspects (Morphology, Organoleptic and Anatomical Characters) of medicinally useful Leaf, Flower, Fruit and Seed						

References: 47,48,51,55,63,80,86,87,88,105,106,107,109,137,138,197,218,219,220,221,222,223,224,225,226,227,247,248,263,266,267

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the Morphological, Organoleptic and Anatomical characters of the Leaf, Flower, Fruit, and Seed Drugs used in Siddha medicine.	2	Lecture	CC	Knows-how	L,L&PPT
CO2	Observe and identify the Morphological, Organoleptic characters of Herbal raw drugs and record for Monograph preparation	6	Practical Training 2.2	CAP	Shows-how	DA
CO2	Demonstrate the use of Medicinal plants in the allied fields like Veterinary, Agriculture, Horticulture, Wildlife and Environmental Science institutes	3	Experiential-Learning 2.1	CC	Does	TBL,FV

M 2 Unit 3 Herbal Market and Geographical Indication (GI) of herbal drugs

2.3.1 Overview of National and International Herbal Trade: Origins, Sources, Seasonal Availability, Trade Names, and Geographical Indication GI-Tagged Herbal Drugs and Spices

References: 51,52,63,86,105,106,107,138,186,187,217,218,219,220,221,223,224,225,242,263,271,272

3A	3B	3C	3D	3E	3F	3G
CO2	Analyse about various Herbal Markets in the State and Nation and their speciality for the drugs and summarize the demand and Supply of Herbs for domestic herbal drug industry.	2	Lecture	CAN	Knows-how	IBL,L
CO2	Analyse various grades and demonstrate the characters of different herbal drugs and aromatic spices	6	Practical Training 2.3	CAN	Shows-how	PBL
CO2	Identify various Herbal drug markets to analyse the grade, quality and trade names of herbal drugs and analyse the characters and qualities of reputed Geographically Indexed (Geo tagged) Medicinal Plants, Food crops, commercial crops and Spices for Quality Assurance, Trade as well as to arrive a strategy for Conservation of these species	10	Experiential-Learning 2.2	CE	Does	BL,FV

M 2 Unit 4 Bureau of Indian Standards (BIS) for Herbal drugs

- 2.4.1 Bureau of Indian Standards Regulations
- 2.4.2 Bureau of Indian Standards(BIS) Grading of Herbal drugs and Spices
- 2.4.3 International grading for Herbal drugs

References: 162,163,252,253,254,264,273

3A	3B	3C	3D	3E	3F	3G
CO2	Describe various gradings of Herbal drugs and spices as per Bureau of Indian Standards (BIS)	2	Lecture	CC	Knows-how	L&PPT, L, ML
CO2	Demonstrate the guidelines of Bureau of Indian Standards (BIS) for herbal drugs	3	Experiential-Learning 2.3	CAP	Knows-how	SDL, FV

M 2 Unit 5 Trade and Commerce in Herbal drugs

- 2.5.1 Export-import rules, procedures and details for herbal drugs.
- 2.5.2 Drug procurement, storage, pest control in storage, packaging and trading methods.
- 2.5.3 Online trading and e-channels for herbal drugs.
- 2.5.4 Herbal Drug/plant quarantine certificate procedure.

References: 51,64,84,274,275

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the rules and procedures for Export and Import of Herbal drugs	2	Lecture	CK	Know	L
CO2	Aspire the qualities of an Entrepreneur in Export-import and Trade of herbal drugs.	10	Experiential-Learning 2.4	AFT-SET	Shows-how	FV

Practical Training Activity

Practical Training 2.1 : Pharmacognostical Evaluation of Herbal raw drugs

Total Hours: 8 Hours

The teacher should demonstrate the morphological terms of herbs.

Students sit in a group and discuss about the morphological and organoleptic characters of the given drugs using their sensory organs, hand lense or dissection microscopes, scales, vernier caliper etc.. Students should wear gloves, goggles, masks for safety aspects.

Characters to be studied are the general appearances, outer cork surface of the stem, bark and root, scars, wrinkles, fissures, fractures, corrugations, colour taste, appearance of cut surfaces etc.. Measurements like length, size, width, circumference etc.

Step 1. Observe the Morphological and organoleptic characters of roots, rhizomes, stems, woods and bark drugs used in Siddha medicine.

Root drugs. 2 Hours; Rhizomes and Stems. 1 Hour; Woods and Barks 1 Hour.

(Each group shall be assigned with a specific organ of the Raw drugs and a discussion can be made at the end of the practical session)

Step 2. Discussion. 2 Hours

Step 3. Record the characters of the drugs. 2 Hours

Practical Training 2.2 : Pharmacognostical evaluation of Herbal raw drugs

Total Hours: 6 Hours

The teacher should demonstrate to analyse the Morphological, Organoleptic characters of leaf, flower, fruit and seed drugs using their sensory organs, hand lense or dissection microscopes, scales, vernier caliper etc.. Students should wear gloves, goggles, masks for safety aspects.

Characters to be studied are the general appearances, outer cork surface of the stem, bark and root, scars, wrinkles, fissures, fractures, corrugations, colour taste, appearance of cut surfaces etc.. Measurements like length, size, width, circumference etc.

Step 1. Students shall sit in groups to discuss about the Morphological and Organoleptic characters of the given drugs as assigned by the teacher.

Step 2. Leaf and Flowers 1 Hour;

Step 3. Fruits and Seeds. 3 hours

(Each group shall be assigned with specific organ of drugs followed by a common discussion at the end of the practical session.)

Step 4. Discussion. 1 Hour

Step 5. Record the Characters of the Drug. 1 Hour.

Practical Training 2.3 : Gradation of Herbal drugs

Total Hours: 6 Hours

The teacher should demonstrate to differentiate the characters and qualities of various grades of given herbal drugs and aromatic spices. Analyse the morphological and organoleptic characters of the given drugs using their sensory organs, hand lense or dissection microscopes, scales, vernier caliper etc. Students should wear gloves, goggles, masks for safety aspects.

Characters to be studied are the general appearances, outer cork surface of the stem, bark and root, scars, wrinkles, fissures, fractures, corrugations, colour taste, appearance

of cut surfaces etc.. Measurements like length, size, width, circumference etc. Estimation of volatile oil content for aromatic spices using standard method.

Step 1. Students shall be provided with various grades of spices and herbal drugs

Step 2. Discussion be made on the various grades of drugs, origin, quality, imported or indigenous, etc. 1 Hour.

Step 3. Analyse the morphological features of the graded drugs and their therapeutic potential. 4 Hours.

Step 4. Record work 1 Hour.

Experiential learning Activity

Experiential-Learning 2.1 : Medicinal plants in Allied Sciences

Total Hours 3 hours.

Each student shall be given with one single field of interest. as Assignment topic.

Step 1. Compile the advantages of Medicinal Plants in the allied fields. 2 Hours.

Step 2. Presentation 1 Hour.

Experiential-Learning 2.2 : Herbal Drug Market

Total Hours: 10 Hours

Each student should record one Geographically Indicated (GI) herbal drug and its details.

Step 1. Identify the GI Herbal products their place of origin and reputation. 4 Hours

Step 2. Get details of the local communities involved in the cultivation and preparation of GI herbal products. 4 Hours

Step 3. Develop strategy to conserve such medicinal plants for continued availability. 1 Hour

Step 4. Presentation. 1 Hour.

Experiential-Learning 2.3 : Bureau of Indian Standards for Herbal drugs

Total Hours: 3 Hours

Assignment and Class Presentation.

Step 1. Collection of Information regarding BIS listed Herbal drugs. 2 Hours

Step 2. Presentation 1 Hour.

Experiential-Learning 2.4 : Export import and Trade of Herbal drugs

Total Hours: 10 Hours

Collect Export-import details of herbal drugs from the reputed Export companies.

Step 1. Students should collect data of Imported drugs, their quantity and trade values. 3 Hours
 Step 2. Data of Exported drugs from Indian Market and their trade values 3 Hours
 Step 3, Global demand for herbal drugs and thier products. 2 Hours
 Step 4. Data of prime Importing Markets and export zones 2 Hours.

Modular Assessment

Assessment method	Hour
Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessment for 50 marks 1. Theory MCQ from units 1-5. 20 Marks (20 questions) 2. Quiz from units 1-5. 15 Marks. (Students shall divided in 2 groups. Each group shall assign with a group code. Each group shall be asked with a question and the score should be recorded based on the answer). The structure of the quiz shall be as follows i) Rapid Fire Question on Drug and their trade names., botanical names, origin etc. ii) Question with multiple choice iii) Visual and Audio based questions on geographical indications, gradings etc iv) True or False with reason 3. Spotters idenetification of raw drugs (3 spotters) 3x5 =15 Marks Macroscopic and Organoleptic examinations of the given raw drugs and add a note on their potential use in Medicine and allied fields Or Any practical in converted form can be taken for Assessment. (25 Marks) And Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks)	4

Semester No : 4

3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/	3G Teachin g Learnin
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			Experientia l Learning		Knows h ow/Kno w)	g Methods
Module 3 : Plant Anatomy and Powdered drug analysis						
Module Learning Objectives (At the end of the module, the students should be able to)						
Describe the Anatomical aspects of Pharmacognosy in Herbal drugs. Conduct micro-sectioning for drug analysis Identify and confirm the drug by performing Powder microscopy						
M 3 Unit 1 Microscopy						
3.1.1 Different types of Microscopes and associated apparatus for measurements 3.1.2 Techniques in Microscopy						
References: 55,247						
3A	3B	3C	3D	3E	3F	3G
CO2	Describe the different types of Microscopes, accessories, their applications like Microscopical measurements and imaging in sectioning.	2	Lecture	CK	Know	L&PPT
CO2	Demonstrate different types of Microscopes using its principles and procedures	4	Practical Training 3.1	CAP	Shows-how	
CO2	Observe and document the functionalities of different Microscopes with usage of modern accessories	6	Experiential-Learning 3.1	CC	Does	D-M,FV

M 3 Unit 2 Plant Histology

3.2.1 Cell differentiation in Plants –Epidermal trichomes, Cork tissue, Sclereids, Fibre, Xylem and Phloem.

3.2.2 Ergastic cell contents –Starch, Protein, Crystals and secretory products

References: 151,248

3A	3B	3C	3D	3E	3F	3G
CO2	Identify different types of plant tissues like Trichomes, Epidermis, Parenchyma, Sclereids, Fibre, Stone cells, Xylem tissue etc.	2	Lecture	CK	Knows-how	L_VC,L&PPT
CO2	Demonstrate the different Plant Tissue systems and Structures for Anatomical Analysis	4	Practical Training 3.2	CAN	Shows-how	DL

M 3 Unit 3 Microscopical Sectioning

3.3.1 Techniques in Sectioning of Plant drugs.

3.3.2 Techniques and procedure in preparing permanent slide

3.3.3 Preparation of permanent slides for future study.

References: 54,55,247

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the techniques of preparing a Microsection, like Sectioning, Staining, Mounting and Focusing for analysis. Demonstrate the procedure for making a Permanent Microscope Sections	2	Lecture	CC	Knows-how	L
CO2	Demonstrate Sectioning and make a Permanent Micro Section according to Standard procedure for future reference study.	6	Practical Training 3.3	PSY-MEC	Shows-how	

CO2	Observe and document the Microscopic techniques like Sectioning, Staining, Mounting and Documentation of Herbal drugs	6	Experiential-Learning 3.2	CC	Knows-how	SDL,FV
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M 3 Unit 4 Anatomical Analysis of Herbal drugs

3.4.1 Anatomical analysis of various herbal drugs mentioned in the Siddha Monographs.

3.4.2 Comparative analysis of herbal drugs having related species.

References: 33

3A	3B	3C	3D	3E	3F	3G
CO2	Describe methods of sectioning of various Herbal plant parts mentioned in the Siddha literature and Anatomical characters of the Herbal drugs.	2	Lecture	CC	Knows-how	L&PPT
CO2	Interpret the Anatomical informations present in the Herbal Pharmacopoeias and Monographs for sourcing the Genuine Herbal drugs	7	Experiential-Learning 3.3	CC	Does	DA,FV

M 3 Unit 5 Powdered Drug Analysis

3.5.1 General use of Reagents for Powder Microscopical Analysis.

3.5.2 Powdered drug Analysis of Siddha Medicinal Plant materials and their methods

References: 55,134,135,247

3A	3B	3C	3D	3E	3F	3G
CO2	Describe about various methods of preparation of Powdered drug for Microscopical examination and general use of Reagents and Stains for Powdered drug Analysis.	2	Lecture	CC	Knows-how	L&PPT
CO2	Identify the unique characters present in the herbal drug and record for future identification of the same drug.	6	Practical Training 3.4	PSY-GUD	Shows-how	

CO2	Observe and document the Standard Operating Procedures in Powder Microscopy of herbal drugs	7	Experiential-Learning 3.4	CAN	Knows-how	FV
Practical Training Activity						
Practical Training 3.1 : Microscopic Techniques						
Total Hours: 4 Hours Manipulation of different types of Microscopes Step 1. Compound Light Microscope, its parts, working principle and manipulation, Focusing of specimen and Imaging. 2 Hours Step 2. Electron Microscopes their parts, working principle and manipulation, Focusing of specimen and imaging 1 Hour Step 3. Record work. 1 Hour						
Practical Training 3.2 : Plant Histology						
Total Hours: 4 Hours Identification of various Plant Tissue systems and Histological structures in the microslides With permanent microslides or with a freshly made sectioned specimen, students shall learn different types of Plant tissues and structures. Step 1. Epidermal tissue system. 30 Minutes Cortical cells. 30 Minutes Ground tissues. 30 Minutes Vascular tissues. 30 Minutes Mesophyl tissues 30 Minutes Step 2. Drawing and Record work 1 Hour. 30 Minutes						
Practical Training 3.3 : Microscopical Sectioning of Herbal drugs						
Total Hours: 6 Hours Make Microscopic sectioning of various plant parts and prepare Permanent slides for Plant Monographs Step 1. Preparation of hand made Microsections of plant drug specimens. 1 Hour Step 2. Staining and dehydration process as per standard procedure. 3 Hours Step 3. Mounting of specimens in canada balsam. 1 Hour						

Step 4. Record drawing. 1 Hour

Each student is asked to take sections of 5 specimens within the given time. The plant specimens are chosen from the authentic Siddha Formulary. Permanent Sections must be labelled, recorded and stored as a physical herbal microscopic repository in the concerned laboratory. New herbal drugs should be assigned in forthcoming years.

Practical Training 3.4 : Powder Drug Analysis

Total Hours: 6 Hours

Perform Powder Analysis of the Herbal drugs used in Siddha system.

The teacher should demonstrate the method of preparation of samples for powder drug analysis and to examine the characters using microscope.

Each student is assigned with 5 herbal drugs for powder microscopical analysis, preferably the same drugs assigned in Anatomical sectioning. Keep Record of the Assignment. New drugs may be assigned in further consecutive years.

Step 1. Preparation of the samples. 1 Hour

Step 2. Performing Powder microscopy and observation of cellular structures. 4 Hours

Step 3. Record and Documentation. 1 Hour.

Experiential learning Activity

Experiential-Learning 3.1 : Microscope Handling

Total Hours: 6 Hours.

Participate in a reputed Pharmacognosy Lab where Anatomical studies of Herbal drugs are carried out on Research basis.

Step 1. Observe the working principles of various modern Microscopes used in Plant Anatomy part of Pharmacognosy. 3 Hours

Step 2. Methods of manipulation of accessories used in such microscopes. 2 Hours

Step 3. Presentation 1 Hour.

Experiential-Learning 3.2 : Microscopic Techniques in Herbal drugs

Total Hours: 6 Hours

Students shall visit a Pharmacognostic Laboratory for advanced techniques in Microscopic sectioning of Plant drugs.

Step 1. Observation of Microscopic procedures in sectioning 4 Hours

Step 2. Recording and Documentation procedures 2 Hours.

Experiential-Learning 3.3 : Anatomical Analysis of Herbal drugs

Total Hours: 7 Hours

Explore various Herbal Monographs and Pharmacopoeias for Source drugs and interpret the details Each student is assigned with 5 herbal drugs for pharmacopoeial references. Keep Records of Assignment. Assigned drugs may not be repeated in the forthcoming years. Step 1. Exploration of standard Herbal Pharmacopoeias and Herbal Monographs 1 Hour for each drug. 5 Hours Step 2. Record and Documentation. 2 Hours.						
Experiential-Learning 3.4 : Powder Drug Analysis						
Total Hours: 7 Hours Learn the techniques of Powder Microscopic procedures in a reputed Pharmacognostic Laboratory. Step 1. Observation of standard procedures for the study of stomatal and Epidermal cells. 2 Hours Step 2. Observation Procedures for the study of Cellular Structures, like crystals, stone cells, starch grains, protein bodies, lignified tissues etc. 4 Hours Step 3. Record keeping and Log book maintenance. 1 Hour.						
Modular Assessment						
Assessment method						Hour
Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessments for 50 marks. 1. Direct Observation of Practical Skills 20 Marks i) Handling of Microscope including cleaning, adjusting lenses and light focus 5 Marks ii) Making Sectioning and staining of the given drug specimen. 5 Marks iii) Mounting and focusing a neat and clear section of the drug. 5 Marks iv) Observation and analyse the tissue systems. 5 Marks 2. Identify the given permanent Microsection of a herbal drug by its specific anatomical features. 5 Marks Or Any practical in converted form can be taken for Assessment. (25 Marks) And Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks)						4
3A Course	3B Learning Objective (At the end of the (lecture/practical training /experiential			3C Notional	3D Lecture/	3E Domain/
						3F Level (D
						3G Teachin

Outcome	learning) session, the students should be able to)	learning Hours	Practical Training/ Experiential Learning	Sub Domain	oes/Shows how/ Knows how/Know)	g Learning Methods
Module 4 : Drug Authentication and Regulations						
Module Learning Objectives (At the end of the module, the students should be able to)						
Describe guidelines in drug Authentication Processes Conduct the Pharmacognostical analysis of herbal drugs for authentication Analyse characters of plants from different herbaria for drug authentication.						
M 4 Unit 1 Adulteration and Substitution						
4.1.1 Study of various adulterants in genuine drugs and their comparative evaluation. 4.1.2 Substitution of Herbal drugs in Siddha medicine.						
References: 55,248						
3A	3B	3C	3D	3E	3F	3G
CO2	Describe the various substitutes and Adulterants of herbal drugs	2	Lecture	CC	Knows-how	L&PPT
CO2	Distinguish the Adulterants from Genuine source drugs Demonstrate the substitute drugs for original herbal drugs	4	Practical Training 4.1	CC	Shows-how	

CO2	Appraise vast knowledge of various adulterants and substitute drugs	8	Experiential-Learning 4.1	PSY-GUD	Shows-how	FV
M 4 Unit 2 Plant Identification 4.2.1 Methods in plant identification – Morphological and Anatomical description, 4.2.2 Chemotaxonomy 4.2.3 Molecular taxonomy 4.2.4 DNA finger printing of medicinal plants References: 30,154,202						
3A	3B	3C	3D	3E	3F	3G
CO2	Describe the Morphological and Anatomical methods in Plant identification and Modern scientific methods like Molecular Taxonomy, Chemotaxonomy and DNA barcoding used in Plant identification	2	Lecture	CC	Knows-how	L
CO2	Identify the Genuine and Adulterant dugs through Morpho-Anatomical characters	8	Practical Training 4.2	CC	Shows-how	DL
CO2	Demonstrate the Standard Operating Procedures for Polymerase Chain Reaction (PCR) and DNA Barcoding of Medicinal plants	6	Experiential-Learning 4.2	CAP	Does	DA
M 4 Unit 3 Medicinal plant databases 4.3.1 Explore the Biodiversity portal, World Flora Online 4.3.2 Plants of the World Online by Royal Botanical Garden. 4.3.3 International Plant Name Index (IPNI) 4.3.4 Indian Medicinal Plants, Phytochemistry and Therapeutics (IMPPAT) 4.3.5 Natural Products ALERT (NAPRALERT) References: 23,30,151,183,230						
3A	3B	3C	3D	3E	3F	3G

CO2	Describe the methodology for Herbarium preparation of an unknown specimen using Standard procedure and Compare the characters of the unknown plant specimen with the Standard voucher specimens of the Regional or Local Herbaria.	2	Lecture	CC	Knows-how	L&PPT
CO2	Identify the Herbal drug sample and Authenticate by referring the Flora, Herbaria and Pharmacopoeias	8	Practical Training 4.3	CAN	Shows-how	PBL
CO2	Develop a protocol for Plant drug Authentication with reference to Regional/National Floras and Herbaria	4	Experiential-Learning 4.3	CC	Does	PSM

M 4 Unit 4 Authentication with Herbaria and Floras

4.4.1 Plant drug Authentication with reference to Botanical Survey of India, local and Regional Herbaria and Floras.

References: 59,82,126

3A	3B	3C	3D	3E	3F	3G
CO2	Identify the unknown Plant specimen by accessing online data bases by sharing images. Access the Research papers on Plant Biodiversity Portal and confirm the identification	2	Lecture	CC	Knows-how	L&PPT ,L
CO2	Explore and document the Plant identification methods through online Plant databases and Applications	4	Experiential-Learning 4.4	CC	Does	DA

M 4 Unit 5 Herbal Drug Regulations

4.5.1 Herbal drug regulations in India – AYUSH guidelines.

4.5.2 International Herbal drug regulations.

4.5.3 Exploration of Indian Pharmacopoeias and Monographs on Indian Medicinal Plants

References: 96,253

3A	3B	3C	3D	3E	3F	3G
CO2	Discuss about the guidelines enforced by AYUSH on Medicinal Plant usage and Analyse the contents of the Pharmacopoeias and individual Monograph of Medicinal Plants.	2	Lecture	CC	Knows-how	L&PPT
CO2	Explore and document the National and International Herbal drug Regulations for Herbal formulations	4	Experiential-Learning 4.5	CC	Does	LS

Practical Training Activity

Practical Training 4.1 : Adulteration and Substitution of herbal drugs

Total Hours: 4 Hours

Find out the structural variations between the adulterant and genuine herbal drugs.

Step 1. Identify various adulterants in Herbal drugs used in Siddha system of Medicine. Analyse them and Record the informations 2 Hours

Step 2. Identify various substitutes of drugs used in Siddha system of Medicine. Analyse them and Record the informations. 2 Hours

Practical Training 4.2 : Plant Identification

Total Hours: 8 Hours

Make a section and compare the Morpho-Anatomical characters of the Genuine and Adulterant Herbal drugs.

Students in groups shall be assigned with common adulterants and their genuine drugs for analysis.

Step 1. Observe and write the Morphological characters of any three genuine and adulterant drugs. 3 Hours.

Step 2. Microscopical analysis of genuine and adulterant drugs. 3 Hours

Step 3. Record keeping and Documentation. 1 Hour

Step 4. Presentation 1 Hour

Practical Training 4.3 : Authentication of Herbal drugs

Total Hours: 8 Hours

Analyse the characters of the given Medicinal plant sample and Authenticate with Morpho-Anatomical characters like shape, form, size, presence of lenticels, scars, fractures (splintery, granular) in bark pieces, cracks, wrinkles, fissures, corrugations etc. Anatomical features of the bark like layers of cork and cork cambium; Type of tissues of the wood (lignified or non lignified) heart wood or sap wood, medullary rays etc. Microscopical linear measurements like length of xylem vessels, fibres, tracheids and their size. Number of Starch grains and their types etc.

Refer the Floras, Herbarium and Pharmacopoeias.

Step 1. Each student is provided with 2 plant specimens (usually a rare or unknown specimen). Ask them to Refer or Analyse the morphological and Anatomical characters using the Flora or Herbaria or Pharmacopoeias 2x3 6 Hours

Step 2. Identify and confirm the name of the drug and Record the informations. 2 Hours

Experiential learning Activity

Experiential-Learning 4.1 : Adulterants and Substitutes of Herbal drugs

Total Hours: 8 Hours

Students should visit various herbal raw drug stores to get samples of drugs for analysis.

Step 1. Identify and document the adulterants and substitutes for source herbal drugs from various Herbal Stores. 6 Hours.

Step 2. Document in log book. 1 Hour

Step 3. Presentation 1 Hour.

Experiential-Learning 4.2 : Medicinal Plant Identification

Total Hours: 6 hours.

Step 1. Explore the available DNA Barcode Data bases of Medicinal plants and compile the data of the assigned plant drug. 4 Hours

Step 2. Record keeping and Documentation. 1 Hour

Step 3. Presentation 1 Hour.

Experiential-Learning 4.3 : Authentication of Medicinal Plants

Total Hours: 4 Hours

Learn the Plant Authentication methods at Botanical Survey of India or Local Herbaria

Step 1. Experience the method of using "Key" in plant identification and Authentication. 2 Hours

Step 2. Experience the usual procedures in plant drug authentication at Herbaria and Raw drug repositories. 1 Hour

Step 3. Log book Documentation. 1 Hour

Experiential-Learning 4.4 : Online Plant identification

Total Hours: 4 Hours

Identification of Medicinal plants through online databases and App based techniques

Step 1. Identify any two unknown or rare plants collected by the student with the studied characters through online databases 3 Hours

Step 2. Presentation 1 Hour.

Experiential-Learning 4.5 : Herbal drug Regulations

Total Hours: 4 Hours

Step 1. Refer online web portals, Pharmacopoeias and Herbal Monographs in various libraries regarding Herbal drug Regulations. 3 Hours

Step 2. Presentation 1 Hour.

Modular Assessment**Assessment method****Hour**

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Choose any of the below assessments for 50 marks.

1. Class Presentation 20 Marks.

i) Student shall explain the methods of referring to Flora and Herbaria for Plant Authentication by explaining the characters of an unknown plant. 10 Marks.

ii) Distinguish adulterant and genuine drug by explaining variations in their Morphological, Anatomical, chemical and other characters. 10 Marks

2. Assignment 20 Marks

Assign 2 Medicinal plants for each student and the students are asked to explore various Pharmacopoeias and Monographs and submit assignments on the monographic details of the given Medicinal Plants. 10 marks for each Plant.

2. Viva from units 1-5. 10 Marks

Or

Any practical in converted form can be taken for Assessment. (25 Marks)

And

Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks).

4

Semester No : 5

3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/	3G Teachin g Learnin
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			Experientia l Learning		Knows h ow/Kno w)	g Methods
Module 5 : Pharmacopoeial Standards of Herbal drugs						
Module Learning Objectives (At the end of the module, the students should be able to) Describe the various evaluation methods for Standardisation of Herbal drugs Analyse the herbal drugs for Quality Assurance and safety use. Identify the herbal drugs using quality assurance parameters .						
M 5 Unit 1 Structural Standards 5.1.1 Origin of herbal drugs and Geographical source 5.1.2 Biological source 5.1.3 Structural parameters (Visible and Microscopical) References: 109,165,197						
3A	3B	3C	3D	3E	3F	3G
CO3	Interpret the origin, geographical source, climatic factors and soil types that brings variation in Medicinal plants.	2	Lecture	CAP	Knows-how	L&PPT ,L
CO3	Analyse the visible Structural characters of the drugs and examine the Microscopical characters to confirm the identity and identify the specific Histological structures found	8	Practical Training 5.1	PSY-MEC	Shows-how	DL

	in the herbal drugs for Authentication					
CO3	Conduct and document Structural Analysis of Herbal drugs	6	Experiential-Learning 5.1	CAN	Does	SDL,LS,FV

M 5 Unit 2 Analytical Standards

5.2.1 Phytochemical analysis - Fluorescent method

5.2.2 Histological analysis.

5.2.3 Phytochemical variations and chemical races in medicinal plant species

References: 96,253

3A	3B	3C	3D	3E	3F	3G
CO3	Discuss the Chemical constituents of the drug and variation in the secondary metabolite using powder analysis and histochemical localization method to confirm quality of herbal drugs	2	Lecture	CAP	Knows-how	L&PPT
CO3	Conduct Analytical study for Chemical Profiling of Herbal drugs.	8	Practical Training 5.2	PSY-GUD	Shows-how	DA
CO3	Perform Powder Analysis for a crude or powdered herbal drug.	4	Experiential-Learning 5.2	CC	Knows-how	DL,FV

M 5 Unit 3 Quality Assurance of Herbal drugs

5.3.1 Methods of determination of purity of herbal drugs and herbal preparations.

5.3.2 Parameters of Quality control

5.3.3 Quality Assurance of Herbal drugs

References: 46,85,96,134,197,254

3A	3B	3C	3D	3E	3F	3G
CO3	Describe the importance of Quality control and and Quality Assurance in Herbal drugs.	2	Lecture	CC	Knows-how	L&PPT
CO3	Demonstrate the methods to determine the Purity of Herbal drugs and Formulations	4	Practical Training 5.3	PSY-GUD	Shows-how	DA
CO3	Assess the herbal drugs with the guidelines of Quality Assurance methods	4	Experiential-Learning 5.3	CE	Shows-how	IBL,FV,P rBL

M 5 Unit 4 WHO guidelines for various contaminants in herbal drugs

5.4.1 Limit tests for pesticide residues, Heavy metals, Radioactive contamination and Microbial contaminations.

References: 252

3A	3B	3C	3D	3E	3F	3G
CO3	Describe the methods of estimation of various contaminants like Pesticide residue, Heavy metals, Radioactive contamination, Microbial contaminations and Foreign organic matter	2	Lecture	CC	Knows-how	L&GD
CO3	Identify on the various contaminant limits for Herbal drugs, prescribed in various Pharmacopoeias and Monographs	6	Experiential-Learning 5.4	CAN	Does	LRI,FV

M 5 Unit 5 Botanical Standards

5.5.1 Botanical Reference Standards (BRS) in authentication of medicinal plant species 5.5.2 Botanical Reference Standards and Biomarkers in Medicinal plants.

5.5.3 Application of BRS in plant drug standardisation and chemical profiles

References: 8

3A	3B	3C	3D	3E	3F	3G
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CO3	Describe the features of Botanical Reference Standards for Herbal drug testing and Authentication	2	Lecture	CC	Knows-how	ML,BL,L &PPT
CO3	Appraise the role of Botanical Reference Substance (BRS) in Herbal Product testing and Authentication.	6	Experiential-Learning 5.5	CC	Does	FV,LS

Practical Training Activity

Practical Training 5.1 : Structural Analysis of Herbal drugs

Total Hours: 8 Hours

Analyse the Structural parameters of the herbal drugs (visible and Microscopic) for drug Standardization

The Teacher shall assign 5 herbal drugs to each student for analysis

Step 1. Each student should evaluate the Sensory Characters of the drugs. 3 Hours

Step 2. Examine the microscopical character of the same drugs. 3 Hours

Step 3. Record the observations. 1 Hour

Step 4. Presentation 1 Hour

Practical Training 5.2 : Phytochemical Analysis of Herbal drugs

Total Hours: 8 Hours.

The teacher should demonstrate the methodology to conduct phytochemical analysis of herbal drugs in the laboratory.

Analyse the Chemical constituents of Herbal drugs for Drug Standardization

Each student shall be provided with 5 drugs for chemical analysis.

Step 1. Sample preparation. 2 Hours

Step 2. Analysis. 5 Hours (1 Hour/ Drug to do 5 chemical analysis)

Qualitative analysis of Chemical constituents present in herbal drugs using standard method.

i. Test for Alkaloid

ii. Test for Glycoside

iii. Test for Flavonoid

iv. Test for Tannin

v. Test for Terpenoids

Step 3. Record and Tabulation. 1 Hour

Practical Training 5.3 : Determination of Purity of Herbal Drugs

Total Hours: 4 Hours

The teacher should demonstrate the methods of determining the foreign organic matter in herbal drugs

Determine the Purity of herbal drugs - Foreign matter by visual inspection (with or without magnifier lens), Sieving method to identify and quantify (in weighing balance) the foreign organic matter.

The teacher shall assign 5 different drugs to students for Analysis.

Step 1. Quantify the Foreign organic matters present in 5 Herbal drugs by standard method. 3 Hours

Step 2. Record the observations. 1 Hour

Experiential learning Activity**Experiential-Learning 5.1 : Structural Analysis of Herbal drugs**

Total Hours: 6 Hours

Each student shall given with a single herbal drug as Assignment. Students should explore the the Pharmacopoeias and Monographs for the details of the structural and Analytical standards.

Step 1. Record the procedure of analysing structural standards of herbal drugs. 5 Hours.

Step 2. Class Presentation 1 Hour.

Experiential-Learning 5.2 : Analytical Standards

Total Hours: 4 Hours

Each student shall assigned with 3 Herbal drugs for the Analysis of Histological structures like trichomes, crystals, stone cells starch grains, fibres, sclereids, vessels etc. in the laboratory using specific reagents as mentioned in the standard procedures.

Step 1. Preparation of Drug Powder for analysis. 1 Hour.

Step 2. Analysis for Histological structures. 2 Hours

Step 3. Interpretation of Results. 1 Hour

Experiential-Learning 5.3 : Quality Control and Evaluation of Herbal drugs

Total Hours: 4 Hours.

Step 1. Students shall visit the nearby pharmaceutical industry to experience the quality assurance activities. 3 Hours.

Step 2. Record in Log book and presentation 1 Hour.

Experiential-Learning 5.4 : Heavy metal Analysis in Herbal Drugs

Total Hours: 6 Hours

Step 1. Inquire into Herbal drug standardization at Herbal drug industry or Pharmacopoeial Laboratory 2 Hours

Step 2. Students shall report a herbal drug sample with Heavy metal and Pesticide analysis. 3 Hours

Step 3. Presentation 1 Hour

Experiential-Learning 5.5 : Botanical Reference Substance (BRS)

Total Hours: 6 Hours

Learn about Botanical Reference Substances (BRS) by referring to Databases and Library

Step 1. Use of Library for the reference of Botanical Reference Substance in Herbal product testing and Authentication. 3 Hours

Step 2. Use of Online databases for reference of BRS. 2 Hours

Step 3. Log book Documentation. 1 Hour

Modular Assessment

Assessment method	Hour
Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessments for 50 marks. 1. Theory case study 25 Marks Each student shall given with a drugs for in-depth study on Structural and Analytical standards and Quality Assurance parameters of the drugs. (Data on Structural standards 5 Marks; Analytical standards 10 Marks; Quality Assurance Parameters 10 Marks). 2. Practical Survey 20 Marks. Each Students shall undergo survey on various contaminants in herbal drugs at the level of cultivation and storage. Report with 2 drugs. 2x10=20 Marks. 3. Self and Peer Assessment. 5 Marks Evaluate the Student's learning autonomy, their productive knowledge and expertise in the learning process on the topic Botanical Reference Standards. Or Any practical in converted form can be taken for Assessment. (25 Marks)	4

And
Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks).

3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/ Experientia l Learning	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/ Knows h ow/Kno w)	3G Teachin g Learnin g Methods
Module 6 : Phytochemistry						
Module Learning Objectives (At the end of the module, the students should be able to)						
Describe the structure, properties of various phytochemicals in plant drugs Conduct Chemical Analysis for powdered or raw herbal drugs Identify the phytoconstituents present in herbal drugs.						
M 6 Unit 1 Alkaloids						
6.1.1 Alkaloids – Definition, occurrence, classification, medicinal importance and detection. 6.1.2 Functional group analysis in alkaloidal drugs using Fourier Transform Infrared spectroscopy (FTIR) and ultraviolet (UV) visible spectroscopy.						
References: 51,52,55,81,109						
3A	3B	3C	3D	3E	3F	3G

CO4	Discuss the Molecular structure, classification, Chemical and Therapeutic properties of Alkaloids.	2	Lecture	CC	Knows-how	L_VC,L&PPT
CO4	Perform Chemical Analysis for Alkaloids in herbal drugs	4	Practical Training 6.1	PSY-GUD	Shows-how	DL,DA
CO4	Observe and document the Functional group Analysis for Alkaloids	6	Experiential-Learning 6.1	CC	Knows-how	SDL,FV

M 6 Unit 2 Glycosides

6.2.1 Glycosides – Definition, occurrence, classification, medicinal importance and detection. 6.2.2 Functional group analysis in Glycosidal drugs using FTIR and UV visible Spectroscopy.

References: 51,52,55,81,109

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the Molecular structure, properties and classification of Glycosides with their kinds poisonous as well as beneficial Glycosides and Identify the Source and availability of Glycosides in the Plant kingdom	2	Lecture	CC	Knows-how	BL,SY,L &PPT
CO4	Perform Phytochemical Analysis for glycosides in herbal drugs	4	Practical Training 6.2	PSY-MEC	Shows-how	
CO4	Document and analyse the Functional group Analysis for Glycosides	6	Experiential-Learning 6.2	CAP	Knows-how	PAL,FV

M 6 Unit 3 Tannins

6.3.1 Tannins – Definition, occurrence, classification, medicinally important tannins and detection. 6.3.2 Functional group analysis in Tannin containing drugs using FTIR and UV visible Spectroscopy.

References: 51,52,81,109

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the Molecular structure, properties, classification of Tannins and their therapeutic effect and anti-nutritional properties. Identify the Source and availability of Tannin containing drugs in the Plant kingdom	2	Lecture	CC	Knows-how	L&PPT
CO4	Perform Phytochemical Analysis for tannins in Herbal drugs.	4	Practical Training 6.3	PSY-MEC	Shows-how	DL
CO4	Appraise and document the Functional group analysis of Tannins.	6	Experiential-Learning 6.3	CAN	Does	FV,BL

M 6 Unit 4 Flavonoids

6.4.1 Flavonoids – Definition, occurrence, important flavonoids and detection. 6.4.2 Functional group analysis using FTIR and UV visible Spectroscopy

References: 51,52,55,81,109

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the Chemical nature, properties, classification and therapeutic importance of Flavonoids and Flavonoids as Nutraceuticals and Identify the source and occurrence of Flavonoids in the Plant Kingdom	2	Lecture	CC	Knows-how	L
CO4	Perform Phytochemical Analysis for Flavonoids in Herbal drugs.	4	Practical Training 6.4	PSY-MEC	Shows-how	PBL
CO4	Document the Functional group analysis for Flavonoids	4	Experiential-Learning 6.4	CAP	Does	FV

M 6 Unit 5 Phytosterols

6.5.1 Phytosterols – Definition, occurrence, classification, medicinal phytosterols and detection. 6.5.2 Functional group analysis of plant sterol drugs using FTIR and UV visible Spectroscopy.

References: 52,55,81,109

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the Chemical structure, properties, classification and therapeutic importance of Plant Sterols and Identify the source and occurrence of Phytosterols in the Plant Kingdom.	2	Lecture	CC	Knows-how	L&PPT ,L&GD
CO4	Perform Phytochemical analysis for Phytosterols in plant drugs	4	Practical Training 6.5	CAN	Shows-how	DA
CO4	Document the Functional Group Analysis of Phytosterols.	4	Experiential-Learning 6.5	CAP	Does	FV

Practical Training Activity

Practical Training 6.1 : Phytochemical Analysis - Alkaloid

Total Hours: 4 Hours

Histochemical localisation and Fluorescent analysis of Alkaloids in 5 Herbal Drugs. Preferably the drugs assigned for Anatomical studies. Keep a record of the Assigned Drugs. The assigned drugs may not be repeated in the forthcoming years.

The teacher should demonstrate the methods of conducting histochemical localisation and fluorescent analysis for alkaloids in herbal drugs

Students should take a hand made section of the herbal drug or using a microtome instrument. For analysis of phytochemicals, use Dragendorff's reagent or Wagners reagent etc. and observe the specific colour change in the tissues of the specimen. Locate the region of the specimen where the phytochemical is present

Step 1. Histochemical localisation of Alkaloids in hand made sections of Herbal Drugs. 2 Hours

Step 2. Fluorescent Analysis for Alkaloids using UV visible spectroscopy in the same raw drugs or powdered herbal Drugs. 2 Hours.

Practical Training 6.2 : Phytochemical Analysis - Glycosides

Total Hours: 4 Hours

Fluorescent Analysis and Histochemical localisation of Glycosides in 5 herbal drugs. Preferably the drugs assigned for Anatomical studies. Keep a Record of the Assigned drugs. The assigned drugs may not be repeated in the forthcoming years.

The teacher should demonstrate the methods of conducting fluorescent analysis and Histochemical localisation for glycosides in herbal drugs.

Students should take a hand made section of the herbal drug or using a microtome instrument. For analysis of phytochemicals, use chemicals as mentioned in the standard procedure and observe the specific colour change in the tissues of the specimen. Locate the region of the specimen where the phytochemical is present

Step 1. Histochemical localisation of Glycosides in hand made sections of Herbal Drugs. 2 Hours

Step 2. Fluorescent Analysis for Glycosids using UV visible spectroscopy in the same raw drugs or powdered herbal Drugs. 2 Hours.

Practical Training 6.3 : Phytochemical Analysis - Tannins

Total Hours: 4 Hours

Histochemical localisation and Fluorescent Analysis of Tannins in 5 Herbal drugs. Preferably the drugs assigned for Anatomical studies. Keep a record of the assigned drugs. The assigned drugs may not be repeated in the forthcoming years.

The teacher should demonstrate the procedure to conduct fluorescent analysis and Histochemical localisation of Tannins in the laboratory.

Students should take a hand made section of the herbal drug or using a microtome instrument. For analysis of phytochemicals, use chemicals as mentioned in the standard procedure and observe the specific colour change in the tissues of the specimen. Locate the region of the specimen where the phytochemical is present

Step 1. Histochemical localisation of Tannins in hand made sections of Herbal Drugs. 2 Hours.

Step 2. Fluorescent Analysis for Tannin using UV visible spectroscopy in the same raw drugs or powdered herbal Drugs. 2 Hours.

Practical Training 6.4 : Phytochemical Analysis -Flavonoids

Total Hours: 4 Hours

Histochemical localisation and Fluorescent analysis for Flavonoids in 5 herbal drugs. Preferably the drugs assigned for Anatomical studies, Keep a record of the assigned drugs. The assigned drugs may not be repeated in the forthcoming years.

The teacher should demonstrate the procedures to conduct histochemical localisation and Fluorescent analysis.

Students should take a hand made section of the herbal drug or using a microtome instrument. For analysis of phytochemicals, use chemicals as mentioned in the standard procedure and observe the specific colour change in the tissues of the specimen. Locate the region of the specimen where the phytochemical is present

Step 1. Histochemical localisation of Flavonoids in hand made sections of Herbal Drugs. 2 Hours

Step 2. Fluorescent Analysis for Flavonoids using UV visible spectroscopy in the same raw drugs or powdered herbal Drugs. 2 Hours.

Practical Training 6.5 : Phytochemical Analysis - Phytosterols

Total Hours: 4 Hours

Histochemical localisation and Fluorescent Analysis of Phytosterols in 5 herbal drugs. Preferably the drugs assigned for Anatomical studies. Keep a record of the assigned drugs. The assigned drugs may not be repeated in the forthcoming years.

The teacher should demonstrate the methods of sampling for histochemical localisation and fluorescent analysing.

Students should take a hand made section of the herbal drug or using a microtome instrument. For analysis of phytochemicals, use chemicals as mentioned in the standard procedure and observe the specific colour change in the tissues of the specimen. Locate the region of the specimen where the phytochemical is present

Step 1. Histochemical localisation of Sterols in hand made sections of Herbal Drugs. 2 Hours
 Step 2. Fluorescent Analysis for Sterols using UV visible spectroscopy in the same raw drugs or powdered herbal Drugs. 2 Hours.

Experiential learning Activity

Experiential-Learning 6.1 : Functional group Analysis - Alkaloids

Total Hours: 6 Hours

The Teacher shall assign a Alkaloid compound to each student to explore the IR data.

Step 1. The student should collect the FTIR data from the available literatures and research journals for the given phytochemical and submit as assignment. 5 Hours

Step 2. Presentation 1 Hour

Experiential-Learning 6.2 : Functional group Analysis - Glycosides

Total Hours: 6 Hours

The Teacher shall assign a glycoside compound to each student to explore the IR data

Step 1. The student should collect the FTIR data from the available literatures and research journals for the given phytochemical and submit as assignment. 5 Hours

Step 2. Presentation 1 Hour.

Experiential-Learning 6.3 : Functional group Analysis - Tannins

Total Hours: 6 Hours

The Teacher shall assign a tannin or Phenolic compound to each student to explore the IR data

Step 1. The student should collect the FTIR data from the available literatures and research journals for the given phytochemical and submit as assignment. 5 Hours

Step 2. Presentation 1 Hour.

Experiential-Learning 6.4 : Functional group Analysis - Flavonoids

Total Hours: 4 Hours

The Teacher shall assign a Flavonoid compound to each student to explore the IR data

Step 1. The student should collect the FTIR data from the available literatures and research journals for the given phytochemical and submit as assignment. 4 Hours

Experiential-Learning 6.5 : Functional Group Analysis - Phytosterols

Total Hours: 4 Hours

The Teacher shall assign a sterol compound to each student to explore the IR data

Step 1. The student should collect the FTIR data from the available literatures and research journals for the given phytochemical and submit as assignment. 4 Hours.

Modular Assessment

Assessment method	Hour
Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessments for 50 marks. 1. Theory Essay writing 10 Marks One LAQ from any one of the units 1-5 2. Theory Viva from units 1-5. 10 Marks 3. Recitation 5 Marks Recitation for understanding on the topic Functional group analysis 4. Practical Performance. 25 Marks Conduct experiments to detect the presence or absence of Alkaloids, Glycosides, Tannins, Flavonoids and Phytosterols in the given plant drug. (5 marks for each phytochemical experiment result). Or Any practical in converted form can be taken for Assessment. (25 Marks) And Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks).	4

Semester No : 6

3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/ Experientia l Learning	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/ Knows h ow/Kno w)	3G Teachin g Learnin g Methods

Module 7 : Study of Herbal drugs based on therapeutic action for selective systems of the body

Module Learning Objectives

(At the end of the module, the students should be able to)

Analyse herbs based on various actions and discuss the phytochemicals responsible for such action.

Conduct the Pharmacognostical evaluation of the herbal drugs.

Extrapolate various Bioassays conducted on medicinal plants to confirm their actions

M 7 Unit 1 Rejuvenating herbs

7.1.1 Adaptogens, Immunomodulators, Rejuvenating and Aphrodisiac Medicinal plants.

7.1.2 Memory enhancing and Nervine tonic plants

7.1.3 Hepatoprotective medicinal plants

7.1.4 Medicinal plants used in the treatment of Geriatric diseases like Arthritis, Alzheimer's, Parkinson's disease, etc with responsible chemical constituents.

References: 34,40,47,52,63,87,88,109,137,138,177,197,260

3A	3B	3C	3D	3E	3F	3G
CO5	Describe about the herbs for restoration of youth and demonstrate their constituents and Antioxidant properties. Classify drugs based on their action, the constituents present in the drug.and Immunomodulators and Anti-rheumatic herbs based on the Chemical constituents responsible for such action.	2	Lecture	CC	Knows-how	Mnt,PL,B S
CO5	Identify the immunomodulator and Antioxidant herbal drugs and explain their pharmacognostical characters	4	Practical Training 7.1	CE	Shows-how	DL

CO5	Explore and document the Bioassay studies on Immunomodulator action and Anti oxidant action of Herbal drugs	6	Experiential-Learning 7.1	CAN	Does	PBL,FV, BL
M 7 Unit 2 Herbal drugs acting on Gastrointestinal tract and Endocrine system 7.2.1 Medicinal plants used in Diabetes mellitus. 7.2.2 Medicinal plants used in the treatment of Obesity. 7.2.3 Medicinal plants in the treatment of gastric ulcers and piles with responsible chemical constituents References: 34,40,63,86,87,88,105,117,137,138,177,260						
3A	3B	3C	3D	3E	3F	3G
CO5	Describe about the Classification of the Herbs used for Gastrointestinal disorders.and their action on Human gut and discuss the activity of herbs on Endocrine gland functions.	2	Lecture	CC	Knows-how	L&PPT ,BL
CO5	Identify the Antidiabetic and Gastrointestinal herbal drugs and explain their pharmacognostical characters	4	Practical Training 7.2	CC	Shows-how	D
CO5	Explore and document the Invivo Experiments for Gastrointestinal and Antidiabetic actions of Herbal drugs	5	Experiential-Learning 7.2	CC	Does	FV
M 7 Unit 3 Herbal drugs acting on Respiratory system 7.3.1 Medicinal plants used in the treatment of Asthma, Tuberculosis, Sinusitis, Allergic rhinitis with responsible chemical constituents. References: 40,52,105,137,138,177						
3A	3B	3C	3D	3E	3F	3G
CO5	Summarize herbs having Expectorant action. Relate the Anti- asthmatic herbs and their Chemical constituents and action. Prescribe herbs for the treatment of tuberculosis in Siddha, their constituents and to explain the Mode of action.	2	Lecture	CAN	Knows-how	L&GD,L, L&PPT

CO5	Identify the Antiasthmatic, antihistaminic and anti-tuberculosis herbal drugs and explain their pharmacognostic characters	4	Practical Training 7.3	CAN	Shows-how	DL
CO5	Explore and observe the Bioassay studies on Antihistaminic, Antiasthmatic and bronchodilator activity of Herbal drugs	5	Experiential-Learning 7.3	CAN	Does	DL,FV

M 7 Unit 4 Anti-Cancer and Anti-microbial herbal drugs

7.4.1 Medicinal plants used in various Cancers.

7.4.2 Anti-viral medicinal plants.

7.4.3 Herbs to treat bacterial infections

7.4.4 Herbs to treat fungal infections with respective therapeutic chemical constituents

References: 34,137,177,260,263

3A	3B	3C	3D	3E	3F	3G
CO5	Interpret the Anticancer compounds and the source of Anti cancer plants and their Mode of action. Assess the Herbal drugs for treating many Bacterial, Viral and Fungal infectious diseases.	2	Lecture	CC	Knows-how	L&PPT ,L&GD
CO5	Identify antimicrobial and Anticancer herbs, explain their pharmacognostic characters	5	Practical Training 7.4	CAN	Shows-how	EDU,PBL
CO5	Document the Antimicrobial, antibacterial, antifungal, anticancer activities of herbal drugs	5	Experiential-Learning 7.4	CAP	Does	D,BL,FV

M 7 Unit 5 Poisonous and Narcotic plant drugs

7.5.1 Narcotic Plants and their legal status

7.5.2 Poisonous plants and antidote plants

7.5.3 Medical Cannabis around the world.

References: 105,137,138,163,166,252,253

3A	3B	3C	3D	3E	3F	3G
CO5	Discuss the role of Poisonous and Narcotic herbs in Human health and their effect. Learn the Antidote medicinal plants Identify the constituents present in various Poisonous and Narcotic herbs. Describe the concept of Medical cannabis, its products, constituents and clinical uses. Understand the (Narcotic Drugs and Psychotropic Substances) NDPS Act 1985. of Cannabis.	2	Lecture	CC	Knows-how	L&PPT
CO5	Differentiate Poisonous plants and Antidote plants	3	Practical Training 7.5	CAP	Shows-how	PSM
CO5	Document the Legal Regulations of the use of Narcotic drugs	5	Experiential-Learning 7.5	CAP	Does	FV,BL,D, CBL

Practical Training Activity

Practical Training 7.1 : Anti-oxidant Herbs

Total Hours: 4 Hours

The teacher should give a list of 10 drugs which include atleast 5 drugs having the potential immunomodulator and anti-oxidant action.

The teacher should demonstrate the pharmacognostical characters of herbal drugs

Step 1. The students should select the immunomodulator and anti-oxidant drugs from the given raw drugs and demonstrate their Pharmacognostical characters. 4 Hours.

Practical Training 7.2 : Herbs for Gastrointestinal (GI) disorders

Total Hours: 4 Hours

The teacher should give a list of 10 drugs which include atleast 5 drugs having the potential anti-diabetic and gastrointestinal action.

Step 1. The students should select the Gastrointestinal and Antidiabetic drugs from the given raw drugs and demonstrate their Pharmacognostical characters. 4 Hours.

Practical Training 7.3 : Herbs for Respiratory Health

Total Hours: 4 Hours

The teacher should give a list of 10 drugs which include atleast 5 drugs having the potential anti-asthmatic, antihistaminic and antituberculosis action.

Step 1. The students should categorize the Anti-asthmatic, antihistaminic and antituberculosis drugs, and demonstrate their pharmacognostic characters. 4 Hours.

Practical Training 7.4 : Antimicrobial herbal drugs

Total Hours: 5 Hours

The teacher should give a list of 10 drugs which include atleast 5 drugs having the potential antimicrobial and 2 drugs having anticancer action.

Step 1. The students should select the antimicrobial drugs and Anticancer drugs from the given raw drugs and demonstrate their Pharmacognostical characters. 5 Hours.

Practical Training 7.5 : Poisonous herbs and their Antidote plants

Total Hours: 3 Hours.

The teacher should give a list of 10 drugs which include atleast 5 drugs having the poisonous character and 2 drugs having antidote action.

The teacher should demonstrate the pharmacognostical characters of the drug

Step 1. The students should select the poisonous drugs and Antidote drugs from the given raw drugs and demonstrate their Pharmacognostical characters. 3 Hours.

Experiential learning Activity

Experiential-Learning 7.1 : Anti-Oxidant Activity

Total Hours: 6 Hours

Teacher should assign topics to groups of students on immunomodulator and antioxidant herbal drugs

Step 1. Explore the authentic journals and enlist Immunomodulator and anti oxidant herbal drugs. Report the findings. 5 Hours

Step 2. Log book documentation and presentation 1 Hour.

Experiential-Learning 7.2 : Herbs for Gastrointestinal disorders

Total Hours: 5 Hours

Step 1. Explore authentic journals for Bioassay studies on Gastrointestinal and anti diabetic activity of Herbal drugs. Report the findings 4 Hours

Step 2. Log Book report and presentation 1 Hour.	
Experiential-Learning 7.3 : Herbs for Respiratory Health	
Total Hours: 5 Hours Step 1. Observation of bioassay studies of herbal drug for Anti histaminic, Antiasthmatic and bronchodilator activity in a pharmacological laboratory. 4 Hours Step 2. Log Book report. 1 Hour.	
Experiential-Learning 7.4 : Herbs for Anti-microbial action	
Total Hours: 5 Hours Step 1. Explore authentic journals for Bioassay studies of Herbal drugs and antimicrobial activity herbs. Report findings. 4 Hours. Step 2. Log book Report and presentation. 1 Hour.	
Experiential-Learning 7.5 : Legal Regulations of Herbal Narcotic Drugs	
Total Hours: 5 Hours Step 1. Explore the Drugs and cosmetics act book, publications from Narcotic Control Board about the Legal use of Narcotic drugs. Report the findings 4 Hours. Step 2. Log book report and Presentation. 1 Hour.	
Modular Assessment	
Assessment method	Hour
Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessments for 50 marks. 1. Assessment of Clinical knowledge 25 Marks i). Ask direct questions or case discussions which integrates knowledge on Medicinal plants and Patient care competencies. 15 Marks ii). Oral questions on knowledge of basic science, clinical science and Research principles of the topic. 10 Marks 2. Application Based Question from any of the units 25 Marks Or Any practical in converted form can be taken for Assessment. (25 Marks) And Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks).	4

3A Course Outcome	3B Learning Objective (At the end of the (lecture/practical training /experiential learning) session, the students should be able to)	3C Notional learning Hours	3D Lecture/ Practical Training/ Experientia l Learning	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/ Knows h ow/Kno w)	3G Teachin g Learnin g Methods
Module 8 : Herbal Cosmetics						
Module Learning Objectives (At the end of the module, the students should be able to) Ensure the safety use of Herbal Cosmetics Exemplify as a specialist in Herbal Cosmetology Demonstrate the qualities of an Entrepreneur						
M 8 Unit 1 Introduction 8.1.1 Herbal cosmetics in Siddha system. 8.1.2 Traditional and Folklore herbal cosmetics. 8.1.3 Plants commonly used in herbal cosmetics. References: 23,80,137,150,266						
3A	3B	3C	3D	3E	3F	3G

CO6	Enumerate the Traditionally used Herbal Cosmetics and their advantage. Discuss the Herbs used in Siddha science as Cosmetics Identify various herbs used in Cosmetology	2	Lecture	CC	Knows-how	BS,BL
CO6	Discuss the modern Herbal Cosmetics and Herbal Cosmetics in Siddha system	6	Experiential-Learning 8.1	CC	Does	JC,FV

M 8 Unit 2 Herbal Hair tonics

- 8.2.1 Hair growth Promotor plants
- 8.2.2 Dye yielding plants
- 8.2.3 Hair colouring and bleaching herbs
- 8.2.4 Anti-dandruff plants and formulations
- 8.2.5 Anti-hair fall herbs their chemical constituents, properties and action.

References: 23,80,266

3A	3B	3C	3D	3E	3F	3G
CO6	Describe the the character, phyto constituents and mode of action of plants used as Hair tonic.	2	Lecture	CC	Knows-how	L&GD,L
CO6	Demonstrate the constituents, method of preparation of Hair oil with Herbal plants and Raw materials.	6	Practical Training 8.1	CAP	Shows-how	
CO6	Manufacture of herbal hair products and become a practitioner/Entrepreneur	6	Experiential-Learning 8.2	AFT-REC	Does	SDL,W,F V

M 8 Unit 3 Herbs for Face and Skin

- 8.3.1 Oils used in facial cosmetics 8.3.2 Herbal cleansers. 8.3.3 Herbal facial cream. 8.3.4 Herbal mouth wash. 8.3.5 Herbal oral creams 8.3.6 Herbal anti-wrinkle creams and skin toners with chemical properties, and action.

References: 23,80,150,266

3A	3B	3C	3D	3E	3F	3G
CO6	Summarize the ingredients, method of preparation of Herbal Facial Creams, Lotions, Lipstick, Mouth wash etc.and their beneficial actions.	2	Lecture	CC	Knows-how	L&PPT ,L&GD
CO6	Prepare herbal Facial creams, Anti-wrinkle creams and become an Entrepreneur	6	Practical Training 8.2	PSY-GUD	Shows-how	
CO6	Demonstrate the methods of preparation of Facial creams	5	Experiential-Learning 8.3	CC	Does	FV,JC

M 8 Unit 4 Product Development of Herbal Cosmetics

8.4.1 Use of Herbal additives, emulsifiers, preservatives, colour, fragrance, excipients, stabilising agents etc.

8.4.2 Methods of preparation of

8.4.2.1 Herbal creams

8.4.2.2 Herbal gels

8.4.2.3 Herbal hair oil

8.4.2.4 Herbal face pack

8.4.2.5 Herbal lipstick

8.4.2.6 Herbal shampoo

8.4.2.7 Herbal lotion

8.4.2.8 Herbal Gummies for hair, nail and skin.

8.4.3 Packing, labeling and marketing methods of cosmetic products.

References: 23,80,150,266

3A	3B	3C	3D	3E	3F	3G
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CO6	Describe about various preparation methods for different Cosmetic Products and methods of packing and labelling of finished Herbal Cosmetic Products	2	Lecture	CC	Knows-how	L
CO6	Demonstrate the preparation of Herbal Soap, Mouth wash and Oral cream	8	Practical Training 8.3	PSY-GUD	Shows-how	
CO6	Compile the procedures of Packing, Labelling and Marketing methods of Herbal Cosmetics	4	Experiential-Learning 8.4	AFT-RES	Does	PrBL,FV

M 8 Unit 5 Regulation in Herbal Cosmetics

- 8.5.1 Compliance of Drug and Cosmetics Act.1940.
- 8.5.2 Bureau of Indian Standards (BIS) guidelines for Cosmetic Products
- 8.5.3 International regulations for Herbal cosmetics
- 8.5.4 Toxicity assays for herbal cosmetics.

References: 24,64

3A	3B	3C	3D	3E	3F	3G
CO6	Discuss the Regulatory guidelines of Drug and Cosmetics Act. Follow the guidelines during the Herbal Cosmetic Product Manufacturing.	2	Lecture	CC	Knows-how	L&PPT ,L
CO6	Document the methods of Skin toxicity studies and Quality control in Herbal drug Cosmetics	5	Experiential-Learning 8.5	AFT-VAL	Does	FV,SDL

Practical Training Activity

Practical Training 8.1 : Herbal Cosmetics - Hair

Total Hours: 6 Hours

Prepare Herbal hair lotions, Oils based on Standard Procedures

The teacher should demonstrate the requirements and procedures in the preparation of herbal lotions, soap and oils.

Step 1. Preparation of Herbal hair lotion. 3 Hours

Step 2. Preparation of Herbal hair oil. 3 Hours.

Practical Training 8.2 : Herbal Facials

Total Hours: 6 Hours

Prepare Herbal facial creams and Antiwrinkle creams as per Standard Procedures

Step 1. Preparation of Facial Cream. 3 Hours

Step 2. Preparation of anti-wrinkle cream. 3 Hours.

Practical Training 8.3 : Herbal Cosmetics - Soap, Mouth wash and Oral cream

Total Hours: 8 Hours

The teacher should demonstrate the herbal ingredients in the preparation of the specified cosmetics

Prepare Herbal soap, Mouth wash and Oral cream as per Standard procedures

Step 1. Preparation of Herbal Soap 3 hours

Step 2. Preparation of Herbal Mouth wash 2 Hours

Step 3. Preparation of Oral cream 3 Hours

Experiential learning Activity

Experiential-Learning 8.1 : Herbal Cosmetics

Total Hours: 6 Hours

Step 1. Review the literatures of modern herbal Cosmetics and cosmetic mentioned in Sidhha system of Medicine. Report the findings. 5Hours

Step 2. Documentation and presentation1 Hour

Experiential-Learning 8.2 : Herbal Cosmetics for Hair

Total Hours: 6 Hours

Step 1. Compare the herbal ingredients of different herbal hair cosmetic formulations. Report the findings 5 Hours

Step 2..Compilation and presentation. 1 Hour

Experiential-Learning 8.3 : Herbal Facials	
Total Hours: 5 Hours Step 1. Explore the different preparations of herbal facial creams from authentic publications. Report the findings. 4 hours Step 2. Documentation and Presentation. 1 Hour.	
Experiential-Learning 8.4 : Herbal Cosmetis - Product Development	
Total Hours Step 1. Compile the methods of Herbal cosmetics Product Developmet from authentic journals and publications. 3 Hours Step 2. Documentation and Presentation 1 Hour.	
Experiential-Learning 8.5 : Regulations of Herbal Cosmetics	
Total Hours: 5 Hours Step 1. Explore the publications relating to Quality Control and toxicity studies on Herbal cosmetics. Report the findings 4 Hours Step 2. Documentation and presentation 1 Hour.	
Modular Assessment	
Assessment method	Hour
Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessments for 50 marks. 1. Performance Based Assessment 20 Marks Each student shall perform a preparation of Herbal cosmetics relevant to the topics. (i) Materials Requirement 5 Marks (ii) Application of Standard Operating Procedure 5 Marks (iii) Reporting the final result 5 Marks (iv) Ethical and safety consideration 5 Maks 2. Formative Assessment. One-minute Paper. 5 Marks Students shall asked to write the answers in Paper individually regarding the understanding of the Topic Herbal Cosmetic Regulations and Cosmetic Product Development.	4

Or

Any practical in converted form can be taken for Assessment. (25 Marks)

And

Any of the Experiential as Portfolios/Reflections/Presentations can be taken as an Assessment. (25 Marks).

Paper No : 2 Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology
Semester No : 3
Module 9 : Mooligai Marunthariviyal (Phytopharmacology)
Module Learning Objectives (At the end of the module, the students should be able to) Describe the properties of Rejuvenating plants, special herbs based on their colour, <i>Veru peyarkalum athan mukkiyathuvamum</i> (Importance of nomenclature), medicinal plants with special features, <i>Thogai sarakkugal</i> (Classified Group of raw drugs/ herbs), <i>Mooligai vaippu sarakku</i> (prepared substitutes for natural substances by synthetic method) <i>Mooligai uppu, satthu</i>. Conduct the <i>Mooligai vaippu sarakku</i> (prepared substitutes for natural substance by synthetic method), <i>Mooligai uppu and satthu</i>. Identify the <i>Kayakarpa Mooligaikal</i> (Rejuvenating Herbs) and Special <i>Karpa mooligaikal</i> based on their colour, <i>Karuppu mooligaikal</i> (Black herbs), <i>Sivappu</i> (Red Varieties), <i>Pon niram</i> (Yellow) and <i>Venmai</i> (White Varieties), medicinal plants with special properties, <i>Thogai sarakkugal</i> (Classified Group of herbal raw drugs)
M 9 Unit 1 Kayakarpa Mooligaikal (Rejuvenating plants) 9.1.1. <i>Kayakarpa Mooligaikal</i> (Rejuvenating plants) 9.1.1.1. Siddha Fundamental principles and therapeutic usage of <i>Mooligai Karpam</i> 9.1.1.2. Method of Preparation, administration, dosage and adjuvant of <i>Mooligai karpam</i> 9.1.1.3. Rules and Regulations to be followed while taking <i>Karpam</i> 9.1.1.4. Pathiyam for <i>Kaya Karpam</i> (Diet Regimen) 9.1.1.5. Types - <i>Pothu Karpa Mooligaikal</i>, <i>Sirappu Karpa Mooligaikal</i> 9.1.1.6. <i>Thani Mooligai Karpam</i> 9.1.1.7. <i>Kootu Mooligai Karpam</i> 9.1.1.8. List of <i>Mooligaikal</i> used as <i>Karpam</i> from <i>Theraiyar Yamaga Venba & Gunapadam Mooligai Vaguppu</i>: 1. Amukkara 2. Azhinjil 3. Aayilpattai 4. Aalampal 5. Aal 6. Inji 7. Uthamani 8. Urulaikizhangu 9. Erukku 10. Elumitcham pazham 11. Elam 12. Orithazhthamarai 13. Kanja 14. Kachchur 15. Kadukkai 16. Kaliyanapoosani 17. Kalippirandai 18. Katrazhai 19. Kaalaan 20. Kittikizhangu 21. Keezhanelli. 22. Kuppaimeni 23. Koraikizhangu 24. Seedeve Sengazhuneer 25. Sirukeerai 26. Seeragam 27. Surai 28. Serankottai 29. Thamarai 30. Thippilli 31. Thulasi 32. Thuthuvelai 33. Thetran 34. Nannari 35. Naanal 36. Nelli 37. Brahmasthanu 38. Panai 39. Puliyarai 40. Ponnankanni 41. Manattakkali 42. Mookkirattai 43. Vasalai 44. Vallarai 45. Vallaikodi 46. Vaatkorai 47. Vila 48. Vennotchi 49. Vembu 50. Malatukku Karpam 51. Pillai peramatamal varunthuvorukku Karpam 52. Tharutya Karpam (Some important <i>Karpa Mooligaikal</i> found in <i>Konganavar Karpam</i>, <i>Pulipani Karpam</i>, <i>Bogar Karpam</i> and other Siddha classical texts) 1. Aththi 2. Avuri 3. Azhukanni 4. Iraththakalli 5. Ilanthai 6. Udhiravengai 7. Etti 8. Ellu 9. Kandangathiri 10. Karanthai 11. Karuvel 12. Kavizhthumbai 13. Kodiveli 14. Sivanarvembu 15. Seenthil 16. Nilakadambu 17. Nilavagai 18. Nerunjil 19. Brahmi 20. Pulluruvi 21. Manjal 22. Marutham 23. Valampurikkai 24. Vidather 25. Vishnukranti etc 9.1.2. <i>Karpa Mooligaikal</i> based on

its colour 9.1.2.1. Unique properties of *Karupu* (Black), *Sivappu* (Red), *Pon niram* (yellow) & *Venmai nira mooligai* (white varieties) and their actions 9.1.2.2. Siddha Special techniques used to enrich the soil for the cultivation of black herbs 9.1.2.3. Immunomodulatory, antioxidant and anti-inflammatory effects of black and other special coloured herbs

References: 1,9,12,20,26,113,231,233

3A	3B	3C	3D	3E	3F	3G
CO1,CO6,CO8	Classify, Characterize and Recite the <i>Kayakarpa mooligaikal</i> (Rejuvenating Plants) mentioned in various Siddha literatures.	1	Lecture	CC	Knows-how	L&PPT ,L,L&GD
CO1,CO2,CO4 ,CO8	Describe the unique properties of special varieties of plants based on their colours (Black, Red, Yellow & White).	1	Lecture	CC	Knows-how	L&GD,L &PPT ,L
CO1,CO7,CO8	Perform the preparation of <i>Mooligai</i> Karpam, Phytochemical analysis on prepared <i>Mooligai</i> Karpam and Black herbs.	4	Practical Training 9.1	PSY-GUD	Shows-how	LRI,DA
CO1,CO6,CO8	Construct the cultivation of Black herbs using the technique of enriching soil with <i>Serankottai</i> (<i>Semecarpus anacardium</i>) and Antioxidant activity of <i>Karpa Mooligai</i> .	5	Experiential-Learning 9.1	CS	Does	DG,ML,P L,LS

M 9 Unit 2 Mooligaikalin Veru Peyargalum Peyarkaranamum (Synonyms and their meanings)

9.2.1. *Veru peyargalum athan mukkiyathuvamum* (Importance of nomenclature) 9.2.2. Vernacular names 9.2.3. Homonyms, Synonyms of various herbs 9.2.4. Synonyms and their meanings 1. *Agathi* 2. *Agil* 3. *Ashogu* 4. *Athimadhuram* 5. *Athividayam* 6. *Atthi* 7. *Antarathamalai* 8. *Anthimalli* 9. *Abini* 10. *Amukkara* 11. *Ammanpacharisi* 12. *Arasu* 13. *Arathai* 14. *Alari* 15. *Alli* 16. *Avarai* 17. *Avuri* 18. *Arugampul* 19. *Adathodai* 20. *Adutheendappalai* 21. *Aamanaku* 22. *Alamaram* 23. *Aavarai* 24. *Ithii* 25. *Iluppai* 26. *Echuramooli* 27. *Ulundhu* 28. *Oomathai* 29. *Etti* 30. *Erukku* 31. *Elumichai* 32. *Ellu* 33. *Kanja* 34. *Kadugu* 35. *Kadukkai* 36. *Kandangathari* 37. *Karisalai* 38. *Karunjeeragam* 39. *Karumbu* 40. *Kazharchi* 41. *Kunkuma poo* 42. *Kuppaimeni* 43. *Kumari* 44. *Kodiveli* 45. *Kotthumalli* 46. *Kondrai* 47. *Gothumai* 48. *Koraikizhangu* 49. *Chathurakalli* 50. *Santhanam* 51. *Sivakaranthai* 52. *Sitramutti* 53. *Seenthil* 54. *Seerakam* 55. *Chukku* 56. *Chundai* 57. *Chenbagam* 58. *Thaneervitan* 59. *Thamarai* 60. *Thippili* 61. *Thillai* 62. *Thumbai* 63. *Thulasi* 64. *Thuthuvalai* 65. *Thennaimaram* 66. *Thettran* 67. *Thottalvadi* 68. *Nancharuppan* 69. *Natthaisoori* 70. *Nannari* 71. *Nayuruvi* 72. *Naval* 73. *Nilappanai* 74. *Nilavembu* 75. *Neermulli* 76. *Nerunchil* 77. *Nelli* 78. *Notchi* 79. *Parangipattai* 80. *Panai* 81. *Pirandai* 82. *Brahmi* 83. *Puli* 84. *Puliyarai* 85. *Ponnankanni* 86. *Manjal* 87. *Maruthamaram* 88. *Milagaranai* 89. *Milagu* 90. *Murungai* 91. *Vallarai* 92. *Vaividangam* 93. *Vaazhai* 94. *Vilvam* 95. *Vengayam* 96. *Vellulli* 97. *Vettrilai* 98. *Vembu* 99. *Veliparuthi* 100. *Velai*, etc.,

References: 26,142,186,188,200,228

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Discuss the reason for Vernacular name.	2	Lecture	CC	Knows-how	DIS,PER,LS,L&GD,L
CO1,CO2,CO7	Document the features for vernacular names based on Siddha aspect.	4	Practical Training 9.2	CE	Shows-how	L&PPT,LS,PL
CO1,CO8	Collect the Vernacular names of various medicinal plants from Siddha Literatures and Demonstrate to Undergraduate students	4	Experiential-Learning 9.2	CAP	Does	SDL,LS,DIS,D,L

M 9 Unit 3 Herbs with Unique Properties

9.3.1. Medicinal plants mentioned in Ancient Tamil Literatures related with Siddha Gunapadam 9.3.2. Medicinal plants growing in *Ainthinai* (Five Landscapes) related with Siddha Gunapadam 9.3.3. Plants used in Rituals and Holistic activities 9.3.4. Plants used as Antidote for poisonous bites and poisonous material intake 9.3.5. *Atta Karma Mooligaikal* 9.3.6. Medicinal Benefits of *Nooru Varuda Palamaiyana Marangal* 9.3.7. Medicinal Benefits of the *Vadaver*

References: 137,186,188,234

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO8	Describe the Herbs with Unique properties.	1	Lecture	CC	Knows-how	L,L&GD
CO2,CO6,CO8	Medicinal Benefits of <i>Nooru Varuda Palamaiyana Marangal</i> (Uses of veteran trees) and Medicinal Benefits of <i>Vadaver</i> (Roots running towards Northern Direction)	1	Lecture	CC	Knows-how	L,L&PPT,D,BL,L&GD
CO1,CO2,CO4,CO7	Examine the phytochemical profiles of plants cultivated in the <i>Ainthinai</i> (Five Landscapes) and in normal or alternative geographical areas.	4	Practical Training 9.3	PSY-MEC	Shows-how	DA,DL,C_L
CO2,CO4,CO8	Document the effective treatment methods for poisonous bite practiced by traditional practitioners. Collect the medicinal properties of herbs used in sacred fire and used in Ritual practices and <i>Attakarma mooligaikal</i> .	5	Experiential-Learning 9.3	AFT-VAL	Does	LS,DIS,PAL,TPW,RLE

M 9 Unit 4 Thogai Sarakkugal (Classified Group of raw drugs/ herbs)

9.4.1. *Thogai sarakkugal* 9.4.1.1. Reasons for grouping and relationship 9.4.1.2. Specific formulations 9.4.1.3. Siddha aspect on the basis of *Suvai, Thanmai, Pirivu* in *Uyir thathukal* and *Udal thathukal* of *Thogai sarakkugal* & Synergistic effect of grouped drugs 9.4.1.4. Organoleptic characters. 9.4.2. Types-Based on Numerical classification 9.4.2.1. *Iru sarakugal* (Group of two) 1. *Iru agathi* 2. *Iru pirandai* 3. *Iru manjal* 4. *Iru nannari* 5. *Iru thuthi* 6. *Iru nerunji* 7. *Iru palai* 8. *Iru pagal* 9. *Iru poola* 10. *Iru seeragam* 9.4.2.2. *Moontru sarakkugal* (Group of Three): 1. *Thirikadugu /Thirikadugam* 2. *Thirikandagam* 3. *Thirikandagi* 4. *Thirikaarasikam* 5. *Thirikaayam* 6. *Thirikirutham* 7. *Thirikumari* 8. *Thirikobam* 9. *Thirisadham* 10. *Thirisaathi* 11. *Thirisaathagam* 12. *Thirisaathigam* 13. *Thirisugantham* 14. *Thirinerunji* 15. *Thirinimbam* 16. *Thiripadu* 17. *Thiripaththiri* 18. *Thiripalai* 19. *Thiriparaagam* 20. *Thiripazham (Mukkani)* 21. *Thirimanjai* 22. *Thirimadhuram* 23. *Thirimoolam* 24. *Thirilavangam* 25. *Thirilavangapoo* 26. *Thirimatham* 27. *Thirumal* 28. *Moondru kuruththu* 29. *Moondru mutti*. 9.4.2.3. *Nanku sarakkugal* (Group of Four): 1. *Kadu sadhursadham* 2. *Kulavintham* 3. *Sathutchakam* 4. *Sathuramilam* 5. *Sathuramlam* 6. *Sadhursadham* 7. *Sathushanam* 8. *Sathurpaththirakam* 9. *Naalennei* 10. *Naalelam* 11. *Naarpalmaram* 12. *Parimalavarkkam* 13. *Paathirikoottam* 14. *Moolasadhurvarkkam* 9.4.2.4. *Ainthu sarakkugal* (Group of Five): 1. *Ainkaayam* 2. *Ainkolam / Panja kolam* 3. *Aindhu saathi* 4. *Ainthuvar* 5. *Ainndhennai* 6. *Aimparuththi* 7. *Aimpunnai* 8. *Aimpurasu* 9. *Aimmaadhulai* 10. *Aimmoolam / Panjamoolam* 11. *Ainthu vitha kasappu/ kaippainthu* 12. *Ainthu vellari* 13. *Ainthu vendai* 14. *Ainthu vetrilai* 15. *Ainthu vembu* 16. *Thiranapanjamoolam* 17. *Panjakkini* 18. *Panja karpam* 19. *Panja kamam* 20. *Panja kaarakam* 21. *Panja sarkkarai* 22. *Panja saadham* 23. *Panja thiraviyam* 24. *Panja deepakkini* 25. *Panja thoobam* 26. *Panja pathiram* 27. *Panja palothakam* 28. *Panja panapoo* 29. *Panjamoolik kashayam* 30. *Panjalokatchayam* 31. *Panjavarkkam* 32. *Panjavaasam* 33. *Panjavilvam* 34. *Mahapanjamoolam* 35. *Lagupanjamoolam* 9.4.2.5. *Aaru sarakkugal* (Group of Six): 1. *Aaru arisigal /Aaruvagai arisi* 2. *Aruvagai saraku* 3. *Satsadham* 4. *Vadamerku aaru* 9.4.2.6. *Ezhuvakai sarakkugal* (Compounds of Seven): 1. *Sarvasaara mooligai* 2. *Saththa varukkam* 9.4.2.7. *Envakai sarakkugal* (Group of Eight): 1. *Atta kantham* 2. *Attakaayam* 3. *Atta santhanam* 4. *Atta chooranam* 5. *Atta dhurkkai mooli* 6. *Atta banthanam* 8. *Atta pushpam* 9. *Atta moolam* 10. *Attavakai* 11. *Attavarkkam* 12. *Atta virutcham* 9.4.2.8. *Onpathu sarakkugal* (Group of Nine): 1. *Navadhaniyam* 2. *Navagraha pushpam* 9.4.2.9. *Patthu sarakkugal* (Group of Ten): 1. *Elathy manjagam* 2. *Ubayanagamalar* 3. *Ubayaver* 4. *Dhasamoolam* 5. *Paththu moolikai* 6. *Mahaadasamooli* 9.4.2.10. *Pathinettu sarakkugal* (Group of Eighteen): 1. *Attadasamoolam* 2. *Pathinen moolam*

References: 98,116,131,137,205,206

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Interpret various combination of <i>Thogai sarakkugal</i> .	2	Lecture	CC	Knows-how	DIS,L,IB L,L&PPT
CO1,CO2,CO3	Organise, Identify, Authenticate and group the <i>Thogai sarakkugal</i> and perform TLC	4	Practical	PSY-	Shows-	LRI,PBL,

,CO4,CO7	analysis		Training 9.4	GUD	how	DA
CO1,CO2,CO3	Appraise the rationale and significance of <i>Thogai sarakkugal</i>	4	Experiential-Learning 9.4	CE	Does	D,BS

M 9 Unit 5 Vaippu Sarakku Muraigal (prepared substitutes for natural substance by synthetic method) and Mooligai Uppu Seimuraigal (Salts derived from the ashes of the medicinal plants)

9.5.1. *Vaippu Sarakku Muraigal* 9.5.1.1. *Abini Vaippu* 9.5.1.2. *Kaichukatti Vaippu* 9.5.1.3. *Kungumapoo Vaippu* 9.5.1.4. *Sampirani Vaippu* 9.5.1.5. *Perungaya Vaippu* 9.5.2. *Mooligai Uppu and Satthu Seimuraigal*

References: 4,27,111,112,116,142,152,153,186,206,277

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3,CO6	Describe the methods of <i>mooligai vaippu</i> and illustrate the methods of preparation of <i>Mooligai Uppu</i>	2	Lecture	CC	Knows-how	SDL,L&GD,L
CO1,CO3,CO4,CO5	Prepare the given <i>Mooligai Sarakku Vaippu</i> and <i>Mooligai Uppu</i> preparation	4	Practical Training 9.5	PSY-MEC	Shows-how	DL,D
CO1,CO3,CO6,CO8	Appraise <i>Mooligai sarakku Vaippu muraigal</i> , <i>Mooligai uppu seimuraigal</i> and physicochemical analysis of ingredients comparison with literature, journals and understanding the benefits	8	Experiential-Learning 9.5	CAN	Does	PER,BL

Practical Training Activity

Practical Training 9.1 : Preparation of *Mooligai Karpam* and Phytochemical analysis

Total hours - 4 hours

Students should be grouped into two or three (Minimum 2, Maximum 4)

Step 1 - Required items for the practical should be issued to the students (15 Mins)

Step 2 - One group should prepare the *Mooligai Karpam*, while another group should collect the black herbs. (45 Mins)

Step 3 - Both groups should perform phytochemical analyses on the prepared *Mooligai Karpam* and the collected black herbs. (3 Hours)

Practical Training 9.2 : Significance of nomenclature.

Total hours - 4 hours

Step 1 - Each student should be assigned 5 plants

Step 2 - Students should go to library to collect vernacular names of the plants from various texts. (1 hour)

Step 3 - Students should identify the significance of nomenclature depending on its morphological characters, habitat, naming according to its properties, naming according to disease cured by the plants. (1 hour)

Step 4 - Students should refer various books and dictionaries to integrate the nomenclature with the above collected facts (1 hour)

Step 5 - Students should organise and document the results observed and submit as record. (1 hour)

Practical Training 9.3 : Phytochemical analysis

Total hours - 4 hours

Step 1 - Each student will be given one *Ainthinai* plant and a terrain plant

Step 2 - Required items for the phytochemical tests shall be issued to the students (15 mins)

Step 3 - Each student will perform the Phytochemical analysis on *Ainthinai* plant and a terrain plant (3 Hours)

Step 4 - Students will compare the results of the plants and submit the results as report (45 mins)

Practical Training 9.4 : Thin Layer chromatography

Total hours - 4 hours

Step 1 - Students should take one *Thogai sarakku* formulation from lot.

Step 2 - Students should collect the component drugs and prepare the sample formulation (45 mins)

Step 3 - Students should prepare the extract from both prepared sample and the individual component drugs (45 mins)

Step 3 - Students should run TLC (Thin Layer Chromatography) to compare the test *Thogai sarakku* and the prepared *Thogai sarakku* extracts (2 hours)

Step 4 - Students should write the results as report and identify the test *Thogai sarakku* is matching with prepared *Thogai sarakku* or not (30 mins)

Practical Training 9.5 : Preparation of *Mooligai Sarakku Vaippu* and *Mooligai Uppu*

Total hours - 4 hours

Step 1 - Students should grouped into two (Minimum 2, Maximum 4)

Step 2 - Required items for the practical should be issued to the students

Step 3 - One group students should perform the preparation of given *Mooligai Sarakku Vaippu* (2 Hours)

Step 4 - Another group students should perform the preparation of given *Mooligai Uppu* (1 1/2 Hours)

Step 5 - Students should document the procedure and record it. (30 mins)

Experiential learning Activity

Experiential-Learning 9.1 : Cultivation of Black herbs and Antioxidant activity of *Karpa Mooligai*

Total hours - 5 hours

Activit 1

Step 1 - Students should visit nearby gardening sector and select any rejuvenating herb for cultivation. (30 mins)

Step 2 - Collect the process of Cultivation of Black herbs and carryout the cultivation. (2 1/2 Hours)

(Note:Cultivation should be continued till the herb turns black)

Activity 2

Step 1 - Students should perform antioxidant activity(DPPH assay) of *Kayakarpa mooligaikal* in a DTL/Research lab.

Step 2 - Students should prepare the sample and DPPH solution. (30 mins)

Step 3 - Students should mix the solutions and leave it for incubation. (30 mins)

Step 4 - Using UV spectrometer students should measure the absorbance reading for the given sample. (30 mins)

Step 5 - Students should calculate and interpret the results and log it. (30 mins)

Experiential-Learning 9.2 : Collection of vernacular names.

Total hours - 4 hours

Step 1 - Students should collect the various vernacular names of assigned medicinal plants (2 Hours)

Step 2 - Assignments should be prepared about the nomenclature of the plant and submitted to the department (1 Hour)

Step 3 - Students should take classes to undergraduate Students. Faculty should observe and assess the teaching ability of the students (1 Hour).

Experiential-Learning 9.3 : Herbs for Poisonous Bites, Rituals & Attakarma.

Total hours - 5 hours

Step 1 - Students should collect several treatment methods for poisonous bite and submit the data as report. (2 1/2 hours)

Step 2 - Students should gather information on the medicinal properties of herbs utilized in Ritual practices. (1 1/2 hours)

Step 3 - Students should collect the medicinal properties of *Attakarma mooligaikal*. (1 hour)

Experiential-Learning 9.4 : Rationale and significance of *Thogai sarakkugal*

Total hours - 4 hours

Step 1 - Students should collect the various <i>Siddha</i> formulations containing <i>Thogai sarakkugal</i>. (30 mins) Step 2- Compile the herbs into groups based on taste. (30 mins) Step 3 - Students should study and note the relationship of herbs/raw drugs and how it helps to balance the excess or deficiency of <i>Thiri Thodam</i>. (1 Hour) Step 4 - Student should study and note how the combination of herbs in <i>Thogai sarakkugal</i> works synergistically to enhance the potency of effectiveness of the formula. (1 Hour) Step 5 - Students should document the compiled data and log it. (1 hour)	
Experiential-Learning 9.5 : <i>Mooligai Sarakku Vaippu muraigal</i> and <i>Mooligai Uppu seimuraigal</i>	
Total hours - 8 hours Activity :1 Step1 - Students should visit the library to explore the various <i>Mooligai sarakku Vaippu muraigal</i> from various classical literatures. (2 Hours) Step 2 - Students should appraise the <i>Vaippu</i> preparation with the natural herb by Phytochemical comparison through literatures, Journals and Monograph studies. (1 Hour) (note: Phytochemical analysis of <i>Vaippu</i> samples collected from practical session) Step 3 - Students should note down all observations made from the literature review. Activity:2 Step 1 - Student shall gather various <i>Mooligai uppu</i> preparation methods from various literatures / journals. (2 Hours) Step 2 - Student should interpret the preparation methods and understand the benefits and therapeutic uses of <i>Mooligai Uppu</i>. (1 1/2 Hours) Step 3 - Student should document all the findings observed from literatures and journals. (1 1/2 Hours)	
Modular Assessment	
Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks 1.Objectives structured Practical examination-(25 Marks) Each Student shall prepare any one <i>mooligai karpam</i> / <i>mooligai uppu</i> / <i>mooligai vaippu</i> and shall do the physicochemical analysis on <i>karpam</i> / <i>Mooligai uppu</i> / <i>Mooligai vaippu sarakku</i> or physicochemical analysis on herb and black herb (eg. Tulasi and black Tulasi) - Preparation of <i>Mooligai karpam</i> - 10 marks	4

- Physicochemical analysis - 10 marks

- Onsite viva-voce – 5 marks

OR

- Physicochemical analysis on common herb - 10 marks

- Physicochemical analysis on black herb - 10 marks

- Onsite viva-voce - 5 marks

2. Theory Exam -(25 Marks)

- Essay writing

- Modified Essay Questions (MEQ) 4 questions each question carries 5 marks

Totally 5 x 4 = 20 marks

- Theory viva-voce - 5 marks

OR

Any practical in converted form can be taken for assessment. (25 marks)

And

Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 marks)

Module 10 : Gunapadam Mooligai Iyal (Siddha Herbal Pharmacology)

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe the botanical names, vernacular names, *suvai* (taste), *thanmai* (character), *veeriyam* (potency), *pirivu* (division), *Seikaikal* (actions), *Pothugunam* (general characters), medicinal uses, phytoconstituents of important medicinal plants as well as Global medicinal plants.

Conduct the Preparation of *Egamooligai prayogam* using herbs, DNA Barcoding for shrubs/creepers, organoleptic evaluation of exudates, Phytochemical mapping of important medicinal plants.

Identify the Single herbal remedies, Therapeutic values of Important Global medicinal plants, authentication of exudates and galls

M 10 Unit 1 Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Herbs

10.1. SIRU SEDIGAL (HERBS)

1. Akkarakkaram – *Anacyclus pyrethrum* DC.
2. Athimathuram – *Glycyrrhiza glabra* L.
3. Athividayam – *Aconitum heterophyllum* Wall. ex Royle
4. Abini & Kasakasaa – *Papaver somniferum* L.
5. Ammaan Patcharisi – *Euphorbia hirta* L.
6. Araththai – *Alpinia galanga* Willd.
7. Alisivithai – *Linum usitatissimum* L.
8. Avuri – *Indigofera tinctoria* L.
9. Arukampul – *Cynodon dactylon* (L.) Pers.
10. Aadutheendapalai – *Aristolochia bracteolata* Lam.
11. Isappukolvidhai – *Plantago ovata* Forssk.
12. Inji – *Zingiber officinale* Roscoe
13. Impooral – *Hedyotis umbellata* L.
14. Rudra Jadai – *Ocimum basilicum* L.
15. Uzhundu – *Vigna mungo* (L.) Hepper
16. Oomathai – *Datura metel* L.
17. Ellu – *Sesamum indicum* L.
18. Elam – *Elettaria cardamomum* (L.) Maton
19. Omam – *Carum copticum* Benth. & Hook.f.; Kurosani Omam – *Hyoscyamus niger* L.
20. Orithazhtamarai – *Hybanthus enneaspermus* (L.) F.Muell.
21. Orilai Tamarai – *Nervilia aragoana* Gaudich.
22. Kanja – *Cannabis sativa* L.
23. Kadalai – *Cicer arietinum* L.
24. Kadugu – *Brassica juncea* (L.) Czern.
25. Kadugurokani – *Picrorhiza scrophulariiflora* Pennell
26. Kandangatthiri – *Solanum surattense* Burm.f.
27. Kanduparangi – *Clerodendrum serratum* (L.) Moon
28. Karanthai – *Sphaeranthus indicus* L.
29. Karisalankanni – *Eclipta prostrata* (L.) L.
30. Karpooravalli – *Anisochilus carnosus* (L.f.) Wall. ex Benth.
31. Karumbu – *Saccharum officinarum* L.

32. Karunaithandu – *Amorphophallus paeoniifolius* (Dennst.) Nicolson
33. Kala – *Carissa carandas* L.
34. Kattrazhai – *Aloe barbadensis* Mill.; Kariyabolam – *Aloe littoralis* Baker
35. Kanchori – *Tragia involucrata* L.
36. Kattathi – *Bauhinia tomentosa* L.
37. Karai – *Catunaregam spinosa* (Thunb.) Tirveng.
38. Karbokarisi – *Psoralea corylifolia* L.
39. Kitchilikizhangu – *Curcuma zedoaria* (Christm.) Roscoe
40. Keeraikal – Aarai – *Marsilea quadrifolia* L.; Puliaarai – *Oxalis corniculata* L.; Manali – *Gisekia pharnaceoides* L.; Puthina – *Mentha arvensis* L.
41. Keezhanelli – *Phyllanthus amarus* Schumach. & Thonn.; Senkeezhanelli – *Phyllanthus urinaria* L.
42. Kungumapoo – *Crocus sativus* L.
43. Kudiyottipoondur – *Argemone mexicana* L.
44. Kuppaimeni – *Acalypha indica* L.
45. Kuruver – *Vetiveria zizanioides* (L.) Nash
46. Kodiveli and its types – *Plumbago indica* L.
47. Kothumalli – *Coriandrum sativum* L.
48. Kottam – *Costus speciosus* (Koen.) Sm.
49. Korai – *Cyperus rotundus* L.
50. Jadamanji – *Nardostachys grandiflora* DC.
51. Sathakuppai – *Anethum graveolens* L.
52. Charanai – *Trianthema decandra* L.
53. Sivathai – *Operculina turpethum* (L.) Silva Manso
54. Sivanar Vembu – *Indigofera aspalathoides* Vahl ex DC.
55. Chitramutti – *Pavonia zeylanica* Cav.
56. Seeragam – *Cuminum cyminum* L.
57. Sukku – *Zingiber officinale* Roscoe
58. Cherupadai – *Mollugo lotoides* Linn.
59. Thamarai – *Nelumbo nucifera* Gaertn.
60. Thaivelai – *Gynandropsis gynandra* (L.) Briq.
61. Thutthi – *Abutilon indicum* (L.) Sweet
62. Thumbai – *Leucas aspera* (Willd.) Link
63. Thulasi – *Ocimum sanctum* L.

64. *Thuthuvelai* – *Solanum trilobatum* L.
65. *Thottarchinungi* – *Mimosa pudica* L.
66. *Naththaichoori* – *Spermacoce hispida* L.
67. *Naabi* – *Aconitum ferox* Wall. ex Ser.
68. *Nayuruvi* – *Achyranthes aspera* L.
69. *Nilavembu* – *Andrographis paniculata* (Burm.f.) Wall. ex Nees
70. *Nilapanai* – *Curculigo orchioides* Gaertn.
71. *Nilaavarai* – *Senna alexandrina* Mill. (or *Cassia senna* L.)
72. *Neermulli* – *Hygrophila auriculata* (Schumach.) Heine
73. *Neichitti* – *Vernonia cinerea* (L.) Less.
74. *Nerunjil* – *Tribulus terrestris* L.; *Seppu Nerunjil* – *Indigofera enneaphylla* L.
75. *Pachilai* – *Garcinia xanthochymus* Hook.f. ex T.Anderson
76. *Paruththi* – *Gossypium arboreum* L.; *Semparuththi* – *Gossypium herbaceum* L.
77. *Parpadagam* – *Hedyotis corymbosa* (L.) Lam.
78. *Peedharohini* – *Coptis teeta* Wall.
79. *Peelai* – *Aerva lanata* (L.) Juss. ex Schult.
80. *Pugaiyilai* – *Nicotiana tabacum* L.
81. *Perungayam* – *Ferula asafoetida* L.
82. *Poduthalai* – *Phyla nodiflora* (L.) Greene
83. *Ponnanganni* – *Alternanthera sessilis* (L.) R.Br. ex DC.
84. *Manjal* – *Curcuma longa* L.; *Kasthuri manjal* – *Curcuma aromatica* Salisb.
85. *Manjitti* – *Rubia cordifolia* L.
86. *Manathakkali* – *Solanum nigrum* L.
87. *Malli* – *Jasminum grandiflorum* L.
88. *Masipathiri* – *Artemisia nilagirica* (C.B.Clarke) Pamp.
89. *Mookkirattai* – *Boerhavia diffusa* L.
90. *Vasambu* – *Acorus calamus* L.
91. *Vandukoli* – *Cassia alata* L.
92. *Vaividangam* – *Embelia ribes* Burm.f.
93. *Vazhai* – *Musa paradisiaca* L.
94. *Vilamichamver* – *Plectranthus vettiveroides* (Jacob) N.P.Singh & B.D.Sharma
95. *Vishnukiranthi* – *Evolvulus alsinoides* (L.) L.

96. Venkayam – *Allium cepa* L.; Kaattu venkayam – *Urginea indica* (Roxb.) Kunth
 97. Venthayam – *Trigonella foenum-graecum* L.
 98. Vellarugu – *Enicostemma axillare* (Lam.) Raynal
 99. Velluli – *Allium sativum* L.
 100. Vaelai / Naaikadugu – *Cleome viscosa* L.

References: 137

3A	3B	3C	3D	3E	3F	3G
CO1,CO3,CO8	Illustrate Gunapadam aspects, Phytoconstituents, Recent research advances and Enumerate the Phytochemical mapping for the medicinal herbs.	2	Lecture	CC	Knows-how	L,L&PPT,ML,L&GD
CO1,CO3,CO7,CO8	Prepare single herb preparation (<i>Egamooligai Prayogam</i>) for the listed medicinal herbs.	3	Practical Training 10.1	PSY-MEC	Shows-how	SDL,D,D L
CO1,CO3,CO8	Organize visit to traditional healers who are practicing single herbal remedies for various diseases	6	Experiential-Learning 10.1	AFT-REC	Does	DG,DL,F V

M 10 Unit 2 Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Creepers, Climbers and Shrubs

10.2.1 KODIGAL (MEDICINAL CREEPERS AND CLIMBERS)

1. Avarai – *Lablab purpureus* (L.) Sweet
2. Akasakarudan – *Corallocarpus epigaeus* (Rottler) C.B. Clarke
3. Attuthumatti – *Citrullus colocynthis* (L.) Schrad.
4. Eechuramooli – *Aristolochia indica* L.
5. Utthamani – *Pergularia daemia* (Forsk.) Chiov.
6. Uppilangodi – *Mimosa paniculata* L.
7. Kallappai kizhangu – *Gloriosa superba* L.
8. Kaliyana poosani – *Benincasa hispida* (Thunb.) Cogn.

9. *Kazharchikodi* – *Caesalpinia bonduc* L.
 10. *Kakkanam* – *Clitoria ternatea* L.
 11. *Kakkaikolli* – *Anamirta cocculus* (L.) Wight & Arn.
 12. *Kurinjan* – *Gymnema sylvestre* R.Br. ex Schult.
 13. *Kundri* – *Abrus precatorius* L.
 14. *Kovai* – *Coccinia grandis* (L.) Voigt
 15. *Seenthil* – *Tinospora cordifolia* (Willd.) Miers
 16. *Thaneervittan kizhanku* – *Asparagus racemosus* Willd.
 17. *Thippili / Thippiliver* – *Piper longum* L.
 18. *Thirakshai* – *Vitis vinifera* L.
 19. *Nancharuppan* – *Tylophora indica* (Burm.f.) Merr.
 20. *Nannari* – *Hemidesmus indicus* (L.) R.Br.
 21. *Neerbirahmi* – *Bacopa monnieri* (L.) Wettst.
 22. *Pirandai* – *Cissus quadrangularis* L.
 23. *Poonaikali* – *Mucuna pruriens* (L.) DC.
 24. *Milagu / Sevviyam* – *Piper nigrum* L.
 25. *Valmilagu* – *Piper cubeba* L.f.
 26. *Musumusukkai* – *Mukia madraspatana* (L.) M.R.Almeida & Sreek.
 27. *Mudakattran* – *Cardiospermum helicacabum* (L.) Sw.
 28. *Vallarai* – *Centella asiatica* (L.) Urb.
 29. *Vellarikai* – *Cucumis sativus* L.
- 10.2.3 **PERUNCHEDUGAI (MEDICINAL SHRUBS)**
1. *Agathi* – *Sesbania grandiflora* (L.) Pers.
 2. *Amukkara* – *Withania somnifera* (L.) Dunal
 3. *Azhavanam* – *Lawsonia inermis* L. (Carl Linnaeus)
 4. *Aadathodai* – *Justicia adhatoda* L.
 5. *Aamanakku* – *Ricinus communis* L.
 6. *Aavarai* – *Cassia auriculata* L.
 7. *Isangu* – *Clerodendrum inerme* (L.) Gaertn.
 8. *Erukku* – *Calotropis gigantea* (L.) W.T.Aiton
 9. *Kadalazhinjil* – *Salacia reticulata* Wight
 10. *Kalli* – *Euphorbia ligularia* L.

11. *Kari vembu – Murraya koenigii (L.) Spreng.*
12. *Chundai – Solanum torvum Sw.*
13. *Sembarathai – Hibiscus rosa?sinensis L.*
14. *Chembai – Sesbania sesban (L.) Merr.*
15. *Parangipattai – Smilax china L.*
16. *Thazhuthazhai – Clerodendrum phlomidis L.*
17. *Thazhai – Pandanus odorifer (Lour.) Spreng.*
18. *Nanthiyavattam – Tabernaemontana divaricata L.*
19. *Notchi – Vitex negundo L.*
20. *Milakaranai – Toddalia asiatica L.*

References: 34,38,105,106,107,113,137,138,165,169,174,197,204,218,219,220,221,222,223,224,226,227,260,263,266

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO7,CO8	Illustrate the Phytoconstituents, Recent research advances and Enumerate the Phytochemical mapping for the <i>Kodigal</i> (creepers and climbers) and <i>Perunchedigal</i> (shrubs).	2	Lecture	CAN	Does	LS,W,L,SDL,ML
CO1,CO2,CO7,CO8	Analyse genetic variation between Shrub species or varieties using RAPD (Random Amplified Polymorphic DNA) Marker Procedure under DNA Barcoding.	4	Practical Training 10.2	CAN	Shows-how	DIS,BL,ML,SDL
CO1,CO2,CO7,CO8	Appraise the knowledge of DNA barcoding methods by Assignments/seminar.	6	Experiential-Learning 10.2	PSY-ADT	Does	PAL,BS,ML

M 10 Unit 3 Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Trees

10.3. MARANGAL (MEDICINAL TREES)

1. *Asogu – Saraca asoca (Roxb.) W.J.de Wilde*
2. *Atthi – Ficus racemosa L.; Seemai atthi – Ficus carica L.; Pei atthi – Ficus hispida L.f.*
3. *Arasu – Ficus religiosa L.*

4. Azhinjil – *Alangium salviifolium* (L.f.) Wangerin
5. Alamaram – *Ficus benghalensis* L.
6. Lavangam – *Syzygium aromaticum* (L.) Merr. & L.M.Perry
7. Lavangapattai – *Cinnamomum verum* J.Presl
8. Iluppai – *Madhuca longifolia* (J.Koenig ex L.) J.F.Macbr.
9. Ilaikalli – *Euphorbia ligularia* Roxb.
10. Eechu - Sitreechu – *Phoenix sylvestris* (L.) Roxb., Pereechu – *Phoenix dactylifera* L.
11. Usilamaram – *Albizia odoratissima* (L.f.) Benth.
12. Rudraksham – *Elaeocarpus sphaericus* (synonym of *Elaeocarpus ganitrus* Roxb.)
13. Etti – *Strychnos nux-vomica* L.
14. Elumichai – *Citrus limon* (L.) Osbeck; Kadaranaraththai – *Citrus medica* L.; Kichilipazham – *Citrus aurantium* L.
15. Udimaram – *Lannea coromandelica* (Houtt.) Merr.
16. Kadukkai – *Terminalia chebula* Retz.
17. Kamugu, Kalippakku – *Areca catechu* L.
18. Karungali – *Acacia catechu* (L.f.) Willd.
19. Karkadagasingi – *Rhus succedanea* L.
20. Kalyanamurrukku – *Erythrina variegata* L.
21. Kungilium – *Shorea robusta* C.F.Gaertn.
22. Kunthirikkam – *Boswellia serrata* Roxb. ex Colebr.
23. Kondrai – *Cassia fistula* L.
24. Chenbagam – *Michelia champaca* L.
25. Sandhanam – *Santalum album* L.
26. Jaathikai, Jaathipathri – *Myristica fragrans* Houtt.
27. Sambirani – *Styrax benzoin* Dryand.
28. Sirunaagapoo – *Mesua ferrea* L.
29. Seekai – *Acacia sinuata* (Lour.) Merr.
30. Serankottai – *Semecarpus anacardium* L.f.
31. Thavasumurungai – *Rungia parviflora* Nees
32. Thalipathiri – *Abies spectabilis* (D.Don) Spach
33. Thaandri – *Terminalia bellirica* (Gaertn.) Roxb.
34. Thengumaram – *Cocos nucifera* L.
35. Devadaru – *Cedrus deodara* (Roxb. ex D.Don) G.Don

36. Thettran – *Strychnos potatorum* L.f.
37. Naaval – *Syzygium cumini* (L.) Skeels
38. Neeradimuthu – *Hydnocarpus laurifolia* (Dennst.) Sleumer
39. Nuna – *Morinda tinctoria* Roxb.
40. Nelli – *Phyllanthus emblica* L.; Arunelli – *Phyllanthus acidus* (L.) Skeels
41. Nervalam – *Croton tiglium* L.
42. Pala – *Artocarpus heterophyllus* Lam.
43. Palasu – *Butea monosperma* (Lam.) Taub.
44. Panai – *Borassus flabellifer* L.
45. Paadhiri – *Stereospermum suaveolens* (Roxb.) DC.
46. Paalai group – *Manilkara hexandra* (Roxb.) Dubard, Ezhilaipalai – *Alstonia scholaris* (L.) R.Br., Vetpaalai – *Wrightia tinctoria* R.Br., Kudsapaalai – *Holarrhena pubescens* Wall. ex G.Don, Theempaalai – *Wattakaka volubilis* (L.f.) Stapf
47. Pidangunari – *Premna tomentosa* Willd.
48. Pungu – *Pongamia pinnata* (L.) Pierre; Manipungu – *Sapindus laurifolius* Vahl
49. Puli – *Tamarindus indica* L.
50. Poovarasu – *Thespesia populnea* (L.) Sol. ex Corrêa
51. Magizh – *Mimulus elengi* L.
52. Mangusthan – *Garcinia mangostana* L.
53. Maramanjai – *Coscinium fenestratum* (Gaertn.) Colebr.
54. Madana kamappu – *Cycas circinalis* L.
55. Marakarai – *Catunaregam spinosa* (Thunb.) Tirveng.
56. Maruthu – *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.
57. Masikkai – *Quercus infectoria* Oliv.
58. Maa – *Mangifera indica* L.
59. Madhulai – *Punica granatum* L.
60. Mavilangu – *Crateva magna* (Lour.) DC.
61. Murungai – *Moringa oleifera* Lam.
62. Moongil – *Bambusa arundinacea* (L.) Voss
63. Valampurikkai – *Helicteres isora* L.
64. Vadhanarayan – *Delonix elata* (L.) Gamble
65. Valuzhuvai – *Celastrus paniculatus* Willd.
66. Vilvam – *Aegle marmelos* (L.) Corrêa

67. Vilamaram – *Limonia acidissima* L.
 68. Vellilothiram – *Symplocos racemosa* Roxb.
 69. Vembu – *Azadirachta indica* A.Juss.
 70. Vel – *Acacia nilotica* (L.) Willd. ex Delile

References: 21,105,106,119,138,174,185,218,219

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO7,CO8	Illustrate Gunapadam aspect, Phytoconstituents, Recent research advances and Enumerate the Phytochemical mapping for the medicinal trees	2	Lecture	CC	Knows-how	LS,L&PP T ,L,REC, L&GD
CO1,CO2,CO7,CO8	Conduct Organoleptic evaluation and Preliminary Phytochemical test of Exudates and Galls	3	Practical Training 10.3	PSY-MEC	Shows-how	PL,D,DA
CO1,CO2,CO7,CO8	Conduct visit for the collection of plant exudates and galls, with comparative analysis across different tree species.	6	Experiential-Learning 10.3	PSY-MEC	Does	TBL,FV

M 10 Unit 4 Gunapadam aspects and recent advances in pharmacognosy, phytochemistry and pharmacology across significant wild and domesticated medicinal plants

10.4. Botanical names, Vernacular names, Suvai (Taste), Thanmai (Character), Veeriyam (Potency) Pirivu (Division), Seigaigal (Actions), Pothugunam (General characters), Medicinal uses and Pharmacological aspects of the following medicinal plants

1. Naattu akrottu – *Aleurites moluccanus* (L.) Willd.
2. Antharathamara – *Pistia stratiotes* L.
3. Anthimalli – *Mirabilis jalapa* L.
4. Ammaiarkoonthal – *Cuscuta reflexa* Roxb.
5. Arivalmookupachilai – *Sida acuta* Burm.f.
6. Alari – *Thevetia peruviana* (Pers.) K.Schum.
7. Aruvatha – *Ruta graveolens* L.

8. Adaiyotti – *Pupalia orbiculata* (Moench) A. Chev.
9. Athondai – *Capparis zeylanica* L.
10. Ayilpattai – *Chukrasia tabularis* A.Juss.
11. Albagodapazham – *Prunus domestica* L.
12. Attrunetti – *Neptunia oleracea* Lour.
13. Aanaikatrashai – *Agave americana* L.
14. Aanaikundrimani – *Adenanthera pavonina* L.
15. Aanaipuliyamaram – *Adansonia digitata* L.
16. Ingimaram – *Caesalpinia coriaria* (Jacq.) Willd.
17. Irattaipeimiratti – *Anisomeles malabarica* (L.) R.Br. ex Sims
18. Iravel sinni – *Rheum emodi* Wall. ex Meissn.
19. Ilandhai – *Ziziphus mauritiana* Lam.
20. Elavu – *Ceiba pentandra* (L.) Gaertn.
21. Mullilavu – *Bombax ceiba* L.
22. Ezhathalari – *Plumeria rubra* L.
23. Uga / Kalarva – *Salvadora persica* L.
24. Uzhalattri – *Ficus exasperata* Vahl
25. Erisalai – *Naravelia zeylanica* (L.) DC.
26. Eliamanakku – *Jatropha curcas* L.
27. Elikadhilai – *Merremia emarginata* (Burm.f.) Hallier f.
28. Ezhuthanipoondu – *Launaea pinnatifida* (Willd.) Sch.Bip. ex Kuntze
29. Ivirali – *Diplocyclos palmatus* (L.) C.Jeffrey
30. Odukkann – *Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.
31. Kanchankorai – *Ocimum album* L.
32. Kadambu – *Anthocephalus cadamba* Roxb. ex Miq.
33. Kadalpaasi – *Gracilaria lichenoides* Greville
34. Kadarpalai – *Argyreia nervosa* (Burm.f.) Bojer
35. Kadalthengai – *Lodoicea maldivica* (J.F.Gmel.) Pers.
36. Kanappoondu – *Exacum pedunculatum* L.
37. Kambalipoochi chedi – *Morus alba* L.
38. Karpoorapul – *Cymbopogon citratus* (DC. ex Nees) Stapf
39. Kalumicchamkai – *Citrus hystrix* DC.

40. Kalluruvi – *Ammania baccifera* L.
41. Kalarva – *Salvadora persica* L.
42. Karipalai – *Tylophora indica* (Burm.f.) Merr.
43. Karkovai – *Melothria heterophylla* L.
44. Karpasi – *Parmelia perlata* (L.) Ach.
45. Karthamarai – *Smilax zeylanica* L.
46. Kaasa – *Memecylon umbellatum* L.
47. Kaasirathnam – *Quamoclit pennata* (L.) Sweet
48. Kaatuamanakku – *Jatropha curcas* L.
49. Kaattu illuppai – *Madhuca indica* (J.F.Gmel.) J.F.Macbr.
50. Kaatu ulunthu – *Teramnus labialis* (L.f.) Spreng.
51. Kaattu Elumichai – *Citrus hystrix*
52. Kaattu ellu – *Sesamum prostratum* Benth.
53. Kaattu karuvappattai – *Cinnamomum iners* Reinw. ex Blume
54. Kaattu kasthuri – *Abelmoschus moschatus* (L.) Medik.
55. Kaattu kirambu – *Ludwigia octovalvis* (Jacq.) P.H.Raven
56. Kattu kollu – *Cassia absus* L.
57. Kaattu sathakuppai – *Anethum graveolens* L.
58. Kaattu thummati – *Cucumis trigonus* Roxb.
59. Kaattu jathikkai – *Myristica malabarica* Lam.
60. Kaattu pagal – *Momordica dioica* Roxb. ex Willd.
61. Kaattu peipudal – *Trichosanthes lobata* Roxb.
62. Kaattu mullangi – *Blumea lacera* (Burm.f.) DC.
63. Kaattuvagai – *Albizia lebbbeck* (L.) Benth.
64. Kaaivallikodi – *Dioscorea alata* L.
65. Kaanamvazhai – *Commelina benghalensis* L.
66. Kittikizhangu – *Acalypha fruticosa* Forssk.
67. Kidaichi – *Aeschynomene indica* L.
68. Kiranthinayagam – *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.
69. Kizhiyural – *Pterospermum acerifolium* (L.) Willd.
70. Kilukiluppai – *Crotalaria retusa* L.
71. Kunmakudori – *Polygonum hydropiper* L.

72. Kuthiraikulambadi - *Sagittaria sagittifolia* L.)
73. Kumizhamaram - *Gmelina arborea* Roxb.
 Nilakumizh - *Gmelina asiatica* L.
74. Kurukkathi - *Hiptage benghalensis* (L.) Kurz
75. Kuruvitchi - *Ehretia microphylla* Lam.
76. Koothamkuthambai - *Lantana indica* L. Roxb.
77. Koontharpanai - *Caryota urens* L.
78. Konchi/Kattukonchi - *Glycosmis arborea* (Roxb.) DC.
79. Kollukaivelai - *Tephrosia purpurea* (L.) Pers.
80. Kodagasalai - *Rungia repens* (L.) Nees
81. Kopuramthangi - *Andrographis echioides* (L.) Nees
82. Kowrivaalpul - *Perotis indica* (L.) Kuntze
83. Sanappu - *Crotalaria juncea* L.
84. Savukku - *Casuarina equisetifolia* L.
85. Savvarisi - *Metroxylon sagu* Rottb.
86. Sanninayagam - *Acmella oleracea* (L.) R.K. Jansen)
87. Sayamaram - *Caesalpinia sappan* L.
88. Sinni - *Acalypha fruticosa* Forssk.
89. Sukkankai - *Cucumis melo* L.
90. Sulukkunayagam - *Panicum antidotale* Retz.
91. Soorai - *Ziziphus oenoplia* (L.) Mill.
92. Saevaganarkizhangu - *Gloriosa superba* L.
93. Thagarai - *Senna tora* (L.) Roxb.)
94. Thakkolam *Illicium verum* Hook.f.
95. Thara - *Fumaria parviflora* Lam.
96. Thalipanai - *Corypha umbraculifera* L.
97. Thumbilikkai - *Diospyros peregrina* (Gurke) P. Royen
98. Naralai - *Cayratia pedata* (Lam.) Gagnep.
99. Nagamalli - *Rhinacanthus nasutus* (L.) Kurz
100. Naanal - *Saccharum spontaneum* L.
101. Nilakadambu - *Asarum europaeum* L.
102. Nilapoosani - *Ipomoea mauritiana* Jacq.

103. Nilampurandi - *Desmodium triflorum* (L.) DC.
104. Ninrarsunungi - *Mimosa hamata* Willd.
105. Neerpoola - *Phyllanthus reticulatus* Poir.
106. Neeralari - *Polygonum barbatum* (L.) H. Hara)
107. Neermaelneruppu - *Ammannia baccifera* L.
108. Nettiingam - *Polyalthia longifolia* (Sonn.) Thwaites
109. Pavalamalli - *Nyctanthes arbor-tristis* L.
110. Pallipoondu - *Striga asiatica* (L.) Kuntze)
111. Paalmaram - *Wrightia species* L.
112. Pavattai - *Pavetta indica* L.
113. Pisinpattai - *Litsea chinensis* (Lam.) Juss.
114. Pirai - *Streblus asper* Lour.
115. Pilavaikolli - *Anisochilus carnosus* (L.f.) Wall. ex Benth.
116. Peenari maram - *Sterculia foetida* L.
117. Pulladi - *Desmodium gangeticum* (L.) DC.
118. Ponmusuttai - *Sida acuta* Burm.f.
119. Mantharai - *Bauhinia purpurea* L.
120. Marima - *Spondias pinnata* (L.f.) Kurz
121. Marul - *Sansevieria roxburghiana* Schult. & Schult.f.
122. Musarkathilai - *Ipomoea pes-caprae* (L.) R.Br.
123. Musuttai - *Rivea ornata* Choisy
124. Munnai - *Premna corymbosa* (Burm.f.) Rottl. & Willd.
125. Mothagavalli - *Sterculia foetida* L.
126. Vallaikodi - *Convolvulus repens* L.
127. Vagai - *Albizia lebbeck* (L.) Benth.
128. Vidather - *Dichrostachys cinerea* (L.) Wight & Arn.
129. Virali - *Dodonaea viscosa* (L.) Jacq.
130. Vengai - *Pterocarpus marsupium* Roxb.

References: 60,63,69,70,71,72,113,197,253

3A	3B	3C	3D	3E	3F	3G
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CO1,CO2,CO8	Describe the vernacular names, parts used, <i>Suvai</i> (Taste), <i>Thanmai</i> (character), <i>Veeriyam</i> (Potency), <i>Pirivu</i> (Ultimate taste), <i>Seigaigal</i> (Actions), <i>Pothugunam</i> (General characters), <i>Maruthuva payangal</i> (Medicinal uses) of listed medicinal plants.	2	Lecture	CC	Knows-how	L,L&GD, REC,L&P PT
CO1,CO2,CO8	Validate Phytochemical Mapping in significant medicinal plants of wild and domestic origin.	6	Practical Training 10.4	PSY-GUD	Shows-how	DL,PAL, DIS
CO1,CO2,CO8	Document the Phytoconstituents, recent research advances & advanced pharmacological aspects and Formulations pertaining to the plants under wild and domestic varieties	2	Experiential-Learning 10.4	CS	Does	BS,BL,IB L

M 10 Unit 5 Pharmacological and Therapeutic Insights into Global Medicinal Plants

10.5. Identification, Botanical names, Vernacular names, Family, Seigaigal (Actions), Active constituents, Pharmacological and Therapeutic uses

1. *Adapathiyai* – *Holostemma adakodien* Schult.
2. *Ayyani pala* – *Artocarpus hirsutus* Lam.
3. *Aadalangkodi* – *Sarcostemma intermedium* Wight & Arn.
4. *Arogyapachchai* – *Trichopus zeylanicus* Gaertn.;
5. *Azhukanni* – *Drosera indica* L.
6. *Aavu maram* – *Holoptelea integrifolia* (Roxb.) Planch.
7. *Irukolli* – *Drypetes roxburghii* (Wall.) Hurus.
8. *Irumbilivithai* – *Diospyros ferrea* (Willd.) Bakh.
9. *Irupaval* – *Gnaphalium luteo-album* L.
10. *Irupoolai* – *Dalbergia sissoo* DC.
11. *Eenthupanai* – *Phoenix sylvestris* (L.) Roxb.
12. *Udharkodi* – *Ichnocarpus frutescens* (L.) W.T.Aiton
13. *Uthira vengai* – *Pterocarpus marsupium* Roxb.
14. *Urutti* – *Habenaria intermedia* D.Don
15. *Ephedra* – *Ephedra gerardiana* Wall. ex Stapf
16. *Elumpurukki* – *Litsea glutinosa* (Lour.) C.B.Rob.
17. *Elumbotti* – *Ormocarpum sennoides* (Willd.) DC.
18. *Eganayagam* – *Salacia fruticosa* Heyne ex Lawson

19. Kaseru – *Scirpus grossus* L.f.
20. Kadal keerai – *Scaevola frutescens* (Mill.) Seem.
21. Kathi avarai – *Canavalia gladiata* (Jacq.) DC.
22. Karpooramaram – *Cinnamomum camphora* (L.) J.Presl
23. Karpoola pul – *Cymbopogon schoenanthus* (L.) Spreng.
24. Karuvilanchikudam – *Smilax zeylanica* L.
25. Karudapachchai – *Selaginella rupestris* Spring
26. Karunthamarai – *Euryale ferox* Salisb.
27. Karumpoola – *Phyllanthus reticulatus* Poir.
28. Karuvallarai – *Viola odorata* L.
29. Kalvazhai – *Canna indica* L.
30. Kallorivanchi – *Rotula aquatica* Lour.
31. Kasithumbai – *Impatiens balsamina* L.
32. Kasini – *Cichorium intybus* L.
33. Kachchi kollu – *Phaseolus lunatus* L.
34. Kaadaikanni – *Avena sativa* L.
35. Kattu inji – *Zingiber zerumbet* (L.) Sm.
36. Kattu valli – *Dioscorea wallichii* Hook.f.
37. Kattu velvenkayam – *Scilla indica* Baker
38. Kaanthari milagai – *Capsicum frutescens* L.
39. Kiluvai – *Commiphora caudata* (Wight & Arn.) Engl.
40. Keerippaalai – *Leptadenia reticulata* (Retz.) Wight & Arn.
41. Kusumpa chedi – *Carthamus tinctorius* L.
42. Kuravankandamooli – *Apama siliquosa* (Lour.) Merr.
43. Kurunji – *Strobilanthes kunthiana* (Wall. ex Nees) T.Anderson
44. Kuzhinaval – *Myrtus communis* L.
45. Kurumbal – *Berberis lycium* Royle
46. Koosu kilangu – *Brassica rapa* L.
47. Koolkodi – *Ziziphus nummularia* (Burm.f.) Wight & Arn.
48. Kesavarthini – *Centratherum punctatum* Cass.
49. Kaiyapputai – *Melaleuca leucadendra* (L.) L.
50. Kottai kala – *Flacourtia indica* (Burm.f.) Merr.

51. Kolukattai mantharai – *Bauhinia acuminata* L.
52. Kodampuli – *Garcinia cambogia* (Gaertn.) Desr.
53. Konghilavam – *Cochlospermum gossypium* DC.
54. Sanjeevi – *Selaginella bryopteris* (L.) Baker
55. Sathai otti – *Peristrophe paniculata* (Forssk.) Brummitt
56. Saboo leard – *Stephania rotunda* Lour.
57. Samuthira pazham – *Barringtonia acutangula* (L.) Gaertn.
58. Sarpagandha – *Rauvolfia serpentina* (L.) Benth. ex Kurz
59. Sallattu virai – *Lactuca serriola* L.
60. Salmukira – *Gynocardia odorata* R.Br.
61. Calendula – *Calendula officinalis* L.
62. Sinduram – *Bixa orellana* L.
63. Sinangu – *Lagerstroemia parviflora* Roxb.
64. Paal nerunjal – *Silybum marianum* (L.) Gaertn.
65. Sivapputhuthi – *Abroma augusta* (L.) L.f.
66. Chiru ilanthai – *Ximenia americana* L.
67. Sirupoonakkali – *Passiflora foetida* L.
68. Cinchona – *Cinchona officinalis* L.
69. Seabuck horn – *Hippophae rhamnoides* L.
70. Jimikki poo – *Vicoa indica* (L.) DC.
71. Seemai alavanam – *Peganum harmala* L.
72. Seemaikarpoo ilai – *Salvia officinalis* L.
73. Seemaikitchili – *Hedychium spicatum* Sm.
74. Seemai thuthi – *Althaea officinalis* L.
75. Jeevakam – *Malaxis rheedei* Rchb.f.
76. Sulli – *Barleria buxiflora* L.f.
77. Senkathari – *Capparis sepiaria* L.
78. Chemmaram – *Aphanamixis polystachya* (Wall.) R.Parker
79. Chemmulli – *Barleria prionitis* L.
80. Semmulli – *Barleria buxifolia* L.f.
81. Jothi virutcham – *Cinnamomum camphora* (L.) J.Presl
82. Sorghamaram – *Simarouba glauca* DC.

83. Somakodi – *Ephedra gerardiana* Wall. ex Stapf
84. Tagarai – *Valeriana wallichii* DC.
85. Tharuppai – *Imperata cylindrica* (L.) Raeusch.
86. Thindika – *Rhus parviflora* Roxb.
87. Thiruvottu maram – *Crescentia cujete* L.
88. Theenda nazhi – *Biophytum sensitivum* (L.) DC.
89. Theepoodu – *Lepidagathis cristata* Willd.
90. Thumbi keerai – *Leucas cephalotes* (Roth) Spreng.
91. Thumburu – *Zanthoxylum armatum* DC.
92. Theyilai – *Camellia sinensis* (L.) Kuntze
93. Thaila pul – *Cymbopogon martinii* (Roxb.) W.Watson
94. Thailamaram – *Eucalyptus globulus* Labill.
95. Thozhukanni – *Codariocalyx motorius* (Houtt.) H. Ohashi
96. Nanjundam – *Ceriscoides turgida* (Roxb.) Tirveng.
97. Naruvalli – *Corchorus capsularis* L.
98. Nari pugaiyilai – *Digitalis purpurea* L.
99. Nithyakalyani – *Catharanthus roseus* (L.) G. Don
100. Nila sampangi – *Polianthes tuberosa* L.
101. Neer nochhi – *Vitex trifolia* L.
102. Nirvanji – *Salix tetrasperma* Roxb.
103. Neelamulli – *Salvia officinalis* L.
104. Nelambari – *Ecbolium viride* (Forssk.) Alston
105. Nettavil – *Antiaris toxicaria* Lesch.
106. Neli gothumai – *Fagopyrum esculentum* Moench
107. Nethira poondur – *Blepharis maderaspatensis* (L.) B. Heyne ex Roth
108. Pasunkottai – *Pistacia vera* L.
109. Paranyavani – *Coleus forskohlii* (Willd.) Briq.
110. Palaiudachi – *Oroxylum indicum* (L.) Kurz
111. Palvalipoondur – *Spilanthes acmella* (L.) L.
112. Pavala kurinji – *Lagerstroemia indica* L.
113. Pazham pasi – *Sida cordata* (Burm.f.) Borss. Waalk.
114. Basanthi – *Reinwardtia indica* Dumort.

115. *Pasil maram* – *Ginkgo biloba* L.
116. *Pachotti* – *Symplocos cochinchinensis* (Lour.) S.Moore
117. *Padakizhangu* – *Cyclea peltata* (Lam.) Hook.f. & Thomson
118. *Perunkurinchan* – *Marsdenia tenacissima* (Roxb.) Wight & Arn.
119. *Pushkaramulam* – *Inula racemosa* Hook.f.
120. *Pulichuvadi* – *Ipomoea pes-tigridis* L.
121. *Pulinagachuvadi* – *Martynia annua* L.
122. *Pumaruttu* – *Lagerstroemia flos-reginae* Retz.
123. *Poonaimesai* – *Orthosiphon stamineus* Benth.
124. *Perumpulladi* – *Desmodium gangeticum* (L.) DC.
125. *Maha vilvam* – *Naringi crenulata* (Roxb.) Nicolson
126. *Manjal arali* – *Thevetia peruviana* (Pers.) K.Schum.
127. *Mayiladum sikai* – *Actiniopteris dichotoma* Bedd.
128. *Maramalli* – *Millingtonia hortensis* L.f.
129. *Marikozhundhu* (Marjoram) – *Origanum majorana* L.
130. *Marundhukoorkan* – *Coleus forskohlii* (Willd.) Briq.
131. *Manoranjitham* – *Artabotrys hexapetalus* (L.f.) Bhandari
132. *Maagali kizhangu* – *Decalepis hamiltonii* Wight & Arn.
133. *Mangai inji* – *Curcuma amada* Roxb.
134. *Milagai poondu* – *Vinca pusilla* Hook.f.
135. *Musukkaipalai* – *Wrightia tomentosa* (Roxb.) Roem. & Schult.
136. *Mudavattukaal* – *Drynaria quercifolia* (L.) J.Sm.
137. *Mullukkala* – *Berberis aristata* DC.
138. *Moovilai* – *Pseudarthria viscida* (L.) Wight & Arn.
139. *Yanai apple* – *Dillenia indica* L.
140. *Yanai chavutadi* – *Elephantopus scaber* L.
141. *Rohini* – *Soymida febrifuga* (Roxb.) A.Juss.
142. *Roma virutcham* – *Euodia lunu-ankenda*
143. *Rosemary* – *Salvia rosmarinus* Spenn.
144. *Thuja* – *Thuja occidentalis* L.
145. *Velakkai* – *Woodfordia fruticosa* (L.) Kurz

References: 119

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO8	Describe the Identification,Therapeutic and Pharmacological actions of the important medicinal plants.	2	Lecture	CAN	Knows-how	DIS,L,L&PPT ,BS, L&GD
CO6,CO7,CO8	Demonstrate the Phytochemical analysis and mapping authentication, availability, distribution, pharmacological actions & therapeutic uses	4	Practical Training 10.5	PSY-GUD	Shows-how	DL,TPW
CO2,CO3,CO6,CO8	Interprete and document herbals used in other stream of medical systems.	6	Experiential-Learning 10.5	PSY-MEC	Does	PL,DIS,TBL,DL

Practical Training Activity**Practical Training 10.1** : Single herb Preparation for the listed medicinal herbs

Total hours - 3 hours

Step 1 - Student will be assigned any plant from the list given in M10:U1 without repetition (15 mins)

Step 2 - Student should prepare minimum 3 Single herb preparation each of a different preparation type (1 1/2 hours)

Step 3 - For each preparation, students will discuss the shelf life, suggest a reasonable expiry date, provide storage recommendations (30 mins)

Step 4 - Group discussion of the herbal drug prepared, dosage and indication and Results should be documented. (45 mins)

Practical Training 10.2 : DNA barcoding analysis

Total hours - 4 hours

Step 1 - Students should visit a DNA Barcoding lab and collect plant tissue material (Sample Collection) (30 mins)

Step 2 - Isolate DNA from the plant tissue using a suitable DNA extraction method (e.g., CTAB protocol or commercial kits). (30 mins)

Step 3 - Students should do PCR Amplification. (2 hours)

Step 4 - Students should do Gel Electrophoresis - Run PCR products on an agarose gel to check the success of amplification. (45 mins)

Step 5 - Students should observe and calculate the band scoring and interpret the results. (15 mins)

Practical Training 10.3 : Organoleptic and phytochemical evaluation.

Total hours - 3 hours

Step 1 - Student should do Morphological and Organoleptic Evaluation (Examine Exudates and Galls for color, texture, taste, odor, solubility). (1 Hour)

Step 2 - Student should perform Preliminary Phytochemical Tests of selected Exudates and Galls. (2 Hours)

Practical Training 10.4 : Phytochemical mapping.

Total hours - 6 hours

Step 1 - Student should visit reputed pharmacology analytical lab or R and D Lab.

Step 2 - Student should select any one plant from the list given in M10:U4 without repetition(15 mins)

Step 3 - Student should prepare minimum 3 extracts using various solvents.(1 3/4 hours)

Step 4- Phytochemical mapping analysis should be done using sophisticated instruments like HPLC/ GC-MS/ AAS etc., (3 Hours)

Step 5 - Results should be documented. (1 Hour)

Practical Training 10.5 : Phytochemical analysis, authentication, distribution, pharmacology and therapeutic uses.

Total hours - 4 hours

Demonstration of the Phytochemical analysis of the plant, distribution, availability pharmacological actions & therapeutic uses

Activity 1:

Step 1 - Students should visit the libraries to acquire knowledge about the availability, distribution and alternatives of plant what they selected. (30 mins)

Step 2 - They should document the collected data in Log book. (30 mins)

Activity 2:

Step 1 - Student should select any one plant from the list given in M10:U5 without repetition

Step 2 - Student should visit reputed pharmacology analytical lab or R and D Lab.

Step 3 - Student should prepare minimum 3 extracts using various solvents. (30 mins)

Step 4 - Qualitative Phytochemical analysis should be done using standard testing methods. (1 Hour)

Step 5 - Results should be documented. (30 mins)

Experiential learning Activity**Experiential-Learning 10.1 : Single herbal remedies**

Total hours - 6 hours

Step 1 - Field visit to learn single herbal drug therapy by traditional healers in common practice across various cultures. (2 Hours)

Step 2 - Students learn use of specific herbs, known for their potent medicinal properties, to address a particular health condition. (2 Hours)

Step 3 - Document the pharmaceutical benefits of the herb and submit as record. (2 Hours)

Experiential-Learning 10.2 : Assignments/ seminar on DNA barcoding methods

Total hours - 6 hours

Activity 1: (4 hours)

Step 1- Seminar by a researcher specializing in plant genetics or ethnobotany to the students to explore the applications of DNA barcoding in the study and documentation of medicinal plants. (1 Hours)

step2 - Question and answer session and discussions on ethical issues, limitations, advancements in DNA barcoding to identify medicinal plants, track biodiversity and prevent species misidentification. (1 Hour)

Step 3 - To learn marker development methods like RAPD(Random Amplified Polymorphic DNA), SCAR(Sequence Characterized Amplified Region), ISSR(Inter Simple Sequence Repeat). (2 Hours).

Activity 2: (2 hours)

Step 1 - Students should refer to formulations pertaining to climbers, creepers and shrubs from Siddha Formulary of India and other Siddha classical text and submit as assignment. (2 Hours)

Experiential-Learning 10.3 : Collection of Exudates and Galls.

Total hours - 6 hours

Step 1 - Field visit for Collection of Exudates and Galls. (2 Hours)

Step 2 - Compare Exudates and Galls from different trees. (1 Hour)

Step 3 - Prepare dried samples and records including botanical name, Siddha name, collection method and uses. The collected products should be submitted in Gunapadam Marunthiyal lab with proper label. (2 Hours)

Step 4 - Present pharmacological evidences by referring online sources and library text references. (1 Hour)

Experiential-Learning 10.4 : Phytoconstituents, recent research advances, Formulations

Total hours - 2 hours

Step 1- Students should visit the libraries to acquire knowledge about the availability, Phytoconstituents, recent research advances, Formulations of plants mentioned under wild and domestic varieties. (1 Hour)

Step 2 - They should collect the data about the uses in various formulations in comparison with various Pharmacopoeias. (30 mins)

Step 3 - They should document the collected data in Log book. (30 mins)

Experiential-Learning 10.5 : Therapeutic value of Global medicinal plants.

Total hours - 6 hours

Step 1 - Organize field trips to local forests, gardens, or agriculture areas to identify and collect a variety of medicinal plant used in other medical systems. (2 Hours)

Step 2 - Classify key medicinal herbs utilized in other medical systems. Analyse the phytochemical constituents of selected herbs and their pharmacological properties. (1Hour)

Step 3 - Discuss the importance of plants used in other medical systems.(1 Hour)

Step 4 - Collected data should be submitted as assignments and seminars should be conducted. (2 Hours)

Modular Assessment

Assessment method

Hour

Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks

1. Class presentation – (10 Marks)

Each student shall do presentation on recent research advances or Phytochemical mapping on any one plant or Traditional and Therapeutic uses of any two plants from unit 4 and unit 5.

2. Objective Structured Practical Examination – (20 Marks)

Identification of given plant or raw drug Physicochemical and Phytochemical analysis to be done.

3. Mini Project – (20 Marks)

Each student shall do a case study on any two plants from unit 4 and unit 5 and publication to be done.

OR

Any practical in converted form can be taken for assessment. (25 marks)

AND

Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment.(25 marks)

4

Semester No : 4

Module 11 : Purification Methods of Herbal Raw drugs, Preparation of Higher-Order Medicines and Monographic Studies of Medicinal Plants

Module Learning Objectives**(At the end of the module, the students should be able to)**

Describe the Significance of purification in *Mooligaikal*, purifying techniques, herbals used in higher order formulations and monographs of key medicinal plants

Conduct the Various purification methods, Prepare Higher order medicines using single herb, Compile Monographs for important medicinal plants.

Identify the Herbals used in preparing potent or higher-order medicines; Record and compare key physicochemical parameters of raw and purified herbals.

M 11 Unit 1 Sutthi Muraigalin Mukkiyathuvam (Significance of Purification)

11.1.1. *Mooligaikalin Sutthi muraigal* 11.1.1.1. *Pothu Sutthi muraigal* (Purifications methods) for Leaves, Flowers, Bark, Root, Tubers 11.1.1.2. Single step purification process 11.1.1.3. Multi step purification process 11.1.2. Significance of purification process

References: 152,261,278,279,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Describe the significance of the purification process and explore various methods used for purifying herbals & its raw drugs.	1	Lecture	CC	Knows-how	L&PPT , L,DIS,L&GD
CO1,CO2,CO8	Perform the purification methods for herbal raw materials.	3	Practical Training 11.1	PSY-GUD	Shows-how	DL,D,TPW
CO2,CO6,CO8	Document rationale behind the purification method and compare the various purification methods	4	Experiential-Learning 11.1	CC	Does	L&GD,P L,L,SDL,LS

M 11 Unit 2 Thathu Mattrum Jeeva Porutkalai Sutthi Seiya Payanpadum Mooligaikal

11.2. *Thathu mattrum Jeeva porutkalai sutthi seiya payanpadum mooligaikal* (Herbs used for the purification of Metal, minerals, animal and animal by products)

11.2.1. Ulogangal 11.2.2. Padanangal 11.2.3. Uparasangal

References: 137,153,186,188,234,276,278,279

3A	3B	3C	3D	3E	3F	3G
CO2,CO3,CO7	Describe the herbals used in the purification of Metals, Minerals and Animal products	2	Lecture	CC	Knows-how	L_VC,L&PPT ,DIS, L&GD,L
CO2,CO3,CO7	Perform of purification methodsfor given metals, minerals and animal products using herbs	4	Practical Training 11.2	PSY-GUD	Shows-how	DL,D
CO2,CO3,CO7	Compare and document the analytical changes at before and after purification of metals / minerals / animal products using herbal extracts.	5	Experiential-Learning 11.2	CAN	Does	DIS,BL,F V,IBL,RL E

M 11 Unit 3 Industrial Techniques and Equipment for Herbal Purification

11.3.1. Industrial Techniques for Herbal Purification 11.3.1.1. Mechanical sorting and grading 11.3.1.2. Washing 11.3.1.3. Drying 11.3.1.4. Steam Sterilization or Pasteurization 11.3.1.5. Gamma Irradiation or UV Treatment 11.3.2. Industrial equipment for herbal purification 11.3.2.1. Mills 11.3.2.2. Decanters and Separators

References: 262

3A	3B	3C	3D	3E	3F	3G
CO2,CO3,CO7	Describe Industrial Techniques for Herbal Purification and equipment	2	Lecture	CAN	Know	DIS,BL,L ,L&PPT ,L&GD
CO2,CO3,CO7	Practice Hands on training in analytical techniques for changes observed before and after purification	4	Practical Training 11.3	PSY-MEC	Shows-how	D,DL,DA
CO2,CO3,CO7	Explore and document Industrial Techniques for Herbal Purification and equipment	5	Experiential-	CE	Does	FV,DIS,S

			Learning 11.3			DL,DA
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M 11 Unit 4 Mooligaikal (Herbals) used for preparing Higher-order Medicines

11.4.1. *Parpamakkum moooligaikal* 11.4.2. *Chenduramakkum moooligaikal* 11.4.3. *Chunnamakkum moooligaikal* 11.4.4. *Kattaakkum moooligaikal*
11.4.5. *Kalangakkum mooligaikal* 11.4.6. *Urukku seiya payanpadum mooligaikal* 11.4.7. *Rasamani seiya payanpadum mooligaikal*

References: 137,234

3A	3B	3C	3D	3E	3F	3G
CO2,CO3	Describe the Herbals used in the preparation of higher order medicines	2	Lecture	CC	Know	L,LS,L&GD,IBL,L&PPT
CO2,CO3	Prepare Higher order medicines using single herb.	4	Practical Training 11.4	PSY-GUD	Shows-how	D,TPW,D L
CO2,CO3	Interpret the relation within the herbs used in the preparation of higher order medicines	6	Experiential-Learning 11.4	PSY-MEC	Does	LS,DA,JC,IBL,SY

M 11 Unit 5 Monographs of Medicinal Plants

11.5. Monographs on Medicinal Plants 11.5.1.Types 11.5.2. General format - description, part used, synonym, botanical name, family name, author citation and distribution, vernacular names, Identification by macroscopy, microscopy, powder microscopy, identification by TLC/GC/HPLC, etc, constituents, Important Formulations, Properties and Action, Therapeutic Uses, Dose, Storage condition, Clinical Studies, Pharmacological studies, Adulterants/Substitutes, Adverse Reaction, Reference. 11.5.3. Authorities to publish monographs.

References: 85,135,254

3A	3B	3C	3D	3E	3F	3G
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CO2,CO3,CO7	Establish Monographs on medicinal plants	3	Lecture	CC	Know	ML,L,L&PPT
CO2,CO3,CO7	Identify the plants, botanically and chemically as per published monograph by ICMR	5	Practical Training 11.5	PSY-GUD	Shows-how	LRI,DL,D
CO2,CO3,CO7	Collect the monograph of assigned plant by texts, various publications, etc	6	Experiential-Learning 11.5	CS	Does	PL,JC,SD L,PrBL,L S

Practical Training Activity

Practical Training 11.1 : Purification techniques for herbal raw materials.

Total Hours: 3 Hours

Step 1 - Required items for the practical should be issued to the students (15 mins)

Step 2 - Students should carry out different purification methods for the assigned plant (2 hours)

Step 3 - Students should document the procedure in record notebook. (45 minutes)

Practical Training 11.2 : Purification methods of given metals, minerals and animal products using herbs

Total Hours: 4 Hours

Step 1 - Provide the students with an overview of the practical. (30 mins)

Step 2- Required items for the practical should be provided to the students

Step 3 - Students should perform the purification of given metal using herbs (1 Hour)

Step 4 - Students should conduct purification of given mineral using herbs (1 Hour)

Step 5 - Students should carry out the purification of given animal product using herbs (1 Hour)

Step 6 - Students should document the procedures and submit as record (30 mins)

Practical Training 11.3 : Instrumental analysis on Herbal raw drug/ herbal before and after purification process

Total Hours : 4 Hours

Sophisticated FTIR instrumentation used for plant analysis / raw drug Before and After purification process to be done

Step 1 -Each group should perform instrumental analysis Before and after purification of the Raw drug

Step 2 - Each group should perform the analysis at every stages of purification or different types of purification (2 Hours)

Step 3 - Students should analyse and validate the changes of Raw drug at every stage of purification and after every purification (1 Hour)

Step 4: Students should keep record and documented. (1 Hour)

Practical Training 11.4 : Preparation of Higher order medicines using single herb.

Total Hours : 4 Hours

Step 1 - Students should visit *Gunapadam Marunthiyal* Practical Lab.

Step 2 - Required items for the practical should be issued to the students

Step 3 - Students should prepare any Higher order medicine using single herb (3 Hours)

Step 4 - Students should observe and document the results in their record notebooks. (1 Hour)

Practical Training 11.5 : Identification of the plants, botanically and chemically as per published monograph

Total Hours: 5 Hours

Step 1 - Students should grouped into two

Step 2 - One group of students should identify the botanical characters with reference to monographs published by ICMR (2 Hours)

Step 3 - One group of students should perform TLC identity test with reference to monographs published by ICMR (2 Hours)

Step 4 - Students should assess and document the collected data in comparison to the monograph. (1 hour)

Experiential learning Activity

Experiential-Learning 11.1 : Collection of various purification methods and its significance.

Total Hours : 4 Hours

Step 1 - Student should go to library

Step 2 - Students should collect various purification techniques for the plants. (2 Hours)

Step 3 - Student should justify the rationale and significance behind the purification techniques. (1 1/2 Hours)

Step 4 - Student should compile all the collected data and submitted as an assignment. (1/2 Hour)

Experiential-Learning 11.2 : Comparison of analytical changes in metals/mineral/animal products before and after purification using herbal extracts.

Total Hours: 5 Hours

Step 1 - Students should visit a nearby research laboratory and be instructed on the working principles of the instruments. (30 mins)

Step 2- Students should analyze the sample for before and after purification with the following parameters:

- Physicochemical parameters (1 hour)
- ICP-OES (1 1/2 hours)
- XRD (1 1/2 hours)

Step 3 - Students should observe and document the reports later. (30 mins)

Experiential-Learning 11.3 : Industrial Techniques for Herbal Purification and equipment

Total Hours : 5 Hours

Collection of purification methods from pharmaceutical company to be done

Step 1 - Student should visit nearby pharmaceutical company.

Step 2 - Students should collect the information and observe the purification techniques adopted by the pharmaceutical company in large quantities. (3 1/2 hours)

Step 3: Students should compile their observations. (1 hour)

Step 4 : Students should submit the documentations to the department. 30 mins)

Experiential-Learning 11.4 : Scientific rationale of the herbs used in the preparation of higher order medicines

Total Hours : 6 Hours

Step 1 - Students should be assigned a metal / mineral raw drug.

Step 2 - Students should visit the library to explore the various plants used in the preparation of any one higher order medicine (*Parpam, Chendooram, Chunnam, Kattu*) (2 hours)

Step 3 - Students should analyse the relations between the herbs used in the preparation of the particular higher order medicines (1 1/2 hours)

Step 4 - Students should interpret the scientific rationale and the similarities of the herbs used in the preparation of higher order medicines(1 1/2 hours)

Step 5 - Students should compile the results and submit the assignment to the Department (1 hour)

Experiential-Learning 11.5 : Collection of plant monographs from texts, journals, etc...

Total Hours : 6 Hours

Step 1 - Each student should assigned with one plant

Step 2 - Student should refer book, Internet for 2 or 3 monographs on the assigned plant (3 1/2 Hours)

Step 3 - Student should compare and analyse the Information pertaining to the monographs. (2 Hours)

Step 4 - Students should submit as record (30 mins)

Modular Assessment

Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks 1. Long answer Questions (LAQ) -(20 Marks) Total 2 Questions Each Question carries 10 Marks 2. Objective Structured Practical Examination -(20 Marks) Each student shall do <i>Sutthi Murai</i> of any one drug - 20 Marks Identification of Drug, morphological description - 5 Marks Materials Required, writing of SOP - 5 Marks Practical Procedure and Result - 10 Marks 3. Interpretation of Plants or Raw drugs - (10 marks) No. of Plants or Raw drugs - 2 Each interpretation contains 5 Marks 1 mark shall be awarded for Identification 1 mark shall be awarded for Organoleptic characters and therapeutic uses 1 mark shall be awarded for interpretation based on <i>Suvai, Thanmai, Pirivu</i> 1 mark shall be awarded for interpretation based on Actions 1 mark shall be awarded for names of preparations pertaining to the plant/raw drug OR Any practical in converted form can be taken for assessment. (25 marks) And Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 marks)	4
Module 12 : Mooligai Maruthuva Payanpadugal (Therapeutic Applications of Medicinal Plants)	

Module Learning Objectives**(At the end of the module, the students should be able to)**

Describe the therapeutic values of medicinal plants for selected diseases, actions and pharmacological activities of plants.
Conduct the drug preparation for selected disease and veterinary practice; in-vitro and in-vivo studies of pharmacological activities.
Identify the therapeutic values of plants for selected diseases from various literatures and its compilations.

M 12 Unit 1 Mode of Action and Pharmacological Profile of Herbals

12.1.1. Action-Specific Phytomedicines 12.1.1.1. Analgesics 12.1.1.2. Antipyretics 12.1.1.3. CNS depressants and stimulants 12.1.1.4. Immunomodulators 12.1.1.5. COX-2 inhibitors 12.1.1.6. Vasodilators 12.1.1.7. Virucidal biocides 12.1.1.8. Phyto-Autacoids 12.1.1.9. Phyto-estrogens 12.1.1.10. Phyto-androgens 12.1.2. Activity-Specific Phytomedicines 12.1.2.1. Neuroprotective 12.1.2.2. Cardioprotective 12.1.2.3. Anti-inflammatory 12.1.2.4. Antiulcer 12.1.2.5. Hepatoprotective 12.1.2.6. Antilipidemic 12.1.2.7. Thrombolytic 12.1.2.8. Lithotriptic 12.1.2.9. Antimicrobial 12.1.2.10. Anticancer 12.1.3. Medicinal plants used in veterinary science

References: 137,138,175,176,234

3A	3B	3C	3D	3E	3F	3G
CO1,CO4,CO8	Describe the pharmacological activity and therapeutic actions of medicinal plants.	2	Lecture	CC	Knows-how	LS,L&G D,L,DIS, L&PPT
CO1,CO8	Demonstrate the Anti-inflammatory in - vivo procedure through acute inflammation method (Carrageenan-induced paw edema)	4	Practical Training 12.1	PSY-GUD	Shows-how	ML,DL,D ,BL,DIS
CO1,CO8	Compile procedures used for in-vivo and in-vitro study of anti-cancer activity and medicinal plants used in veterinary practice from various literature sources and external references.	5	Experiential-Learning 12.1	PSY-GUD	Does	BL,DIS,P L,LS,JC

M 12 Unit 2 The Pharmacological Potential of Herbs in Different Physiological Systems

12.2.1. Endocrine system 12.2.2. Musculoskeletal system 12.2.3. Cardiovascular system 12.2.4. Respiratory system 12.2.5. Gastro intestinal system 12.2.6. Hepatobiliary system 12.2.7. Genito-urinary system

References: 137,234

3A	3B	3C	3D	3E	3F	3G
CO1,CO4,CO8	Describe the Therapeutic applications of medicinal plants categorized by biological systems	2	Lecture	CC	Knows-how	L,L&GD, BL,DIS,L &PPT
CO1,CO8	Prepare a single-herb topical formulation for musculoskeletal conditions.	3	Practical Training 12.2	PSY-GUD	Shows-how	D,SDL,D L
CO1,CO8	Compile the meta-analytical reviewing of procedures done for Hepato-protective in-vivo and in-vitro studies.	4	Experiential-Learning 12.2	CS	Does	DIS,TPW ,ML,BL,L S

M 12 Unit 3 Herbo-medical management for Specific diseases and injuries

12.3.1. Gastro Esophageal Reflux Diseases (GERD) 12.3.2. Obesity 12.3.3. Polycystic Ovarian syndrome (PCOS) 12.3.4. Chronic Kidney Diseases (CKD) 12.3.5. Cholelithiasis 12.3.6. Herpes zoster 12.3.7. Non-Communicable Diseases - Diabetes mellitus, Hypertension, Carcinoma, Arthritis, Parkinson's disease 12.3.8. Phyto-medicines for Sports injuries and *Kalari*, *Malyutham*, *Silambam*, etc., (Martial arts) injuries

References: 137

3A	3B	3C	3D	3E	3F	3G
CO1,CO4,CO8	Describe the methods of use of plants for Specific disease, <i>Thottira noigal</i> (non-Communicable Diseases), Sports and <i>Kalari</i> (martial arts) injuries.	2	Lecture	CC	Knows-how	DIS,L&G D,L,L&P PT

CO1,CO8	Prepare a single drug formulation for <i>Thottra noigal</i> (non-communicable diseases) and compound drug for external application to treat sports and marital art injuries.	5	Practical Training 12.3	PSY-GUD	Shows-how	DIS,DL
CO1,CO8	Document the literature review of plants used in the treatment of <i>Thottra noigal</i> (non-communicable diseases), Sports and marital art injuries.	6	Experiential-Learning 12.3	CS	Does	W,DIS,L S,BS

M 12 Unit 4 Herbals used in the treatment of Thoal noigal (Skin diseases)

12.4.1. *Thoal noigal* (Skin diseases) 12.4.1.1 *Kanakadi* (Urticaria) 12.4.1.2. *Sori/namaichal* (Pruritis) 12.4.1.3. *Karappan* (Eczema) 12.4.1.4. *Kalanjakappadai* (Psoriasis) 12.4.1.5. *Venpulli/ Venpadai/venkuttam* (Leucoderma) 12.4.1.6. *Padarthamarai* (Tinea) 12.4.1.7. *Pilavai* (Carbuncles) 12.4.1.8. *Viranam/Punngal* (Wounds) 12.4.1.9. *Thee punn* (Burns) and *Vennir punn* (Scalds) 12.4.1.10. *Kuttam/Kurai noi* (Hansen's diseases)

References: 137

3A	3B	3C	3D	3E	3F	3G
CO1,CO4,CO8	Describe the methods of use of plants for <i>Thoal noigal</i> (Skin diseases)	2	Lecture	CC	Knows-how	L&PPT , L&GD,DIS,L
CO1,CO8	Prepare a single drug medication for <i>Thoal noigal</i> . (Skin diseases)	4	Practical Training 12.4	PSY-GUD	Shows-how	DL,D,DIS
CO1,CO8	Document the Literature review of medicinal plants used in the treatment of <i>Thoal noigal</i> (Skin diseases).	5	Experiential-Learning 12.4	CK	Does	JC,ML,L S

M 12 Unit 5 Therapeutic Applications of Herbal Medicines in Ophthalmology and ENT

12.5.1. *Kann noigal* (Ophthalmic diseases) 12.5.2. *Kaathu noigal* (Ear diseases) 12.5.3. *Mooku noigal* (Nasal diseases) 12.5.4. *Thondai noigal* (Throat diseases)

References: 137

3A	3B	3C	3D	3E	3F	3G
CO1,CO5,CO8	Describe the methods of use of plants for <i>Kann noigal</i> (Eye diseases), <i>Kaathu noigal</i> (Ear diseases), <i>Mooku noigal</i> (Nasal diseases) and <i>Thondai noigal</i> (Throat diseases)	2	Lecture	CC	Knows-how	L&GD,L &PPT ,BL,L
CO1,CO8	Prepare a <i>Egamooligai prayogam</i> (single drug) for <i>Kann noigal</i> (Eye diseases), <i>Kaathu noigal</i> (Ear diseases), <i>Mooku noigal</i> (Nasal diseases) and <i>Thondai noigal</i> (Throat diseases).	4	Practical Training 12.5	PSY-GUD	Shows-how	D,PL,PER,DIS
CO1,CO8	Document the literature review of plants used in the treatment of <i>Kann noigal</i> (Eye diseases), <i>Kaathu noigal</i> (Ear diseases), <i>Mooku noigal</i> (Nasal diseases) and <i>Thondai noigal</i> (Throat diseases).	6	Experiential-Learning 12.5	CS	Does	LS,DIS,B S,PL

Practical Training Activity

Practical Training 12.1 : Exhibition of Anti-inflammatory invivo procedure through acute inflammation method

Total Hours: 4 Hours

Step 1 - Students shall go to Pharmacological laboratory.

Step 2 - Required animals, items for the practical should be issued to the students.

Step 3 - Each student should do a In-vivo study experiment on anti-inflammatory activity through the Carrageenan-induced paw edema method. (2 Hours)

Step 4 - Discussions about their experience in the time of preparation should be made with others and with the faculties. (1 Hour)

Step 5 - The observations and results should be documented in record notebook. (1 Hour)

Practical Training 12.2 : Preparation of single-herb topical formulation.

Total Hours: 3 Hours

Step 1 - Students shall go to *Gunapadam Marunthiyal* Practical Lab.

Step 2 - Required items for the practical should be issued to the students

Step 3 - Each student should do a practical on a single drug formulation for musculoskeletal system in topical application. (2 Hours)

Step 4 - The observations and results should be documented in record notebook. (1 Hour)

Practical Training 12.3 : Herbal medicine preparation for NCD and Sports & marital art injuries.

Total Hours: 5 Hours

Activity 1: (total 2 1/2 hours)

Step 1 - Students should go to *Gunapadam Marunthiyal* Practical Lab.

Step 2 - Required items for the practical should be issued to the students

Step 3 - Each student should done practical on a single drug from their collection for *Thottra noigal* (non-communicable diseases) (Collection Done in Experiential learning) (1 1/2 hours)

Step 4 - The observations and results should be documented in record notebook. (1 hour)

Activity 2: (total 2 1/2 hours)

Step 1 - Students should go to *Gunapadam Marunthiyal* Practical Lab.

Step 2 - Required items for the practical should be issued to the students.

Step 3 - Each student should do a practical on external drug formulation from their collection for sports and marital art related injuries (Collection Done in Experiential learning) (1 1/2 hours)

Step 4 - The observations and results should be documented in record notebook. (1 hour)

Practical Training 12.4 : Preparation of single drug medication for *Thoal noigal*.

Total Hours: 4 Hours

Step 1 - Students should be grouped into two or three (Minimum 2, Maximum 4)

Step 2 - Required items for the practical should be issued to the students

Step 3 - Each group should perform the preparation of a single drug from their collection (Done in Experiential learning) (1 Hour)

Step 4 - Students should visit the any Govt/ private pharmacological analytical lab or R and D lab.

Step 5 - Students should do the In vitro Pharmacological activity of the drug. (2 Hours)

Step 6 - The results should be documented in record notebook and they should prepare a chart or model. (1 Hour)

Practical Training 12.5 : *Egamooligai Prayogam* for Ophthalmic diseases and Ear, Nose and Throat diseases

Total Hours: 4 Hours

Step 1 - Students should be grouped into two or three (Minimum 2, Maximum 4)

Step 2 - Required items for the practical should be issued to the students

Step 3 - Each group should perform the preparation of a single drug from their collection (Done in Experiential learning) (1 Hour)

Step 4 - Students should visit the any Govt/ private pharmacological analytical lab or R and D lab.

Step 5 - Students should prepare the extract from the prepared medicine (1 Hour)

Step 6 - Students should do the standardisation of the drug (1 1/2 Hours)

Step 7 - The results should be documented in record notebook. (1/2 Hour)

Experiential learning Activity

Experiential-Learning 12.1 : Documentation of anti-cancer activity procedures and herbs used in veterinary practices

Total Hours 5 Hours

Activity 1: (2 Hours)

Step 1 - Students should visit/browse the library/e-library/journals.

Step 2 - Students should collect the procedures used for in-vivo and in-vitro study of anti-cancer activity. (1 Hour)

Step 3 - Students should organise all the collected information and should submit as a project or an assignment. (1 Hour)

Activity 2: (3 hours)

Step 1 - Each student should visit to on-site vets/veterinary clinics/labs.

Step 2 - Students should do the literature review of plants used in the treatment of cattle diseases and other domestic animal ailments from various Siddha texts. (1 hour)

Step 3 - Students should collect the single drug/Drug formulations for cattle and other domestic animal diseases, names of medicines pertaining to the plant for the particular diseases and Pharmacological activities data of the plants from Siddha literatures. (1 1/2 hours)

Step 4 - Students should organise all the collected information and should submit as a project or an assignment. (30 mins)

Experiential-Learning 12.2 : Meta-analysis of in-vivo and in-vitro hepatoprotective activity

Total Hours: 4 Hours

Step 1 - Each student should visit the library/e library.

Step 2 - Students should collect the procedures used for Hepatoprotective activity in in - vivo studies from various literature sources, Journals, etc. (1 1/2 hours)

Step 3 - Student should collect the procedures used for Hepatoprotective activity in invitro studies from various literature sources, Journals, etc. (1 1/2 hours)

Step 4 - Students should organize all the collected information and should submit as an assignment/ project. (1 hour)

Experiential-Learning 12.3 : Literature review of medicinal plants used for NCD and Sports & marital art injuries

Total Hours: 6 Hours

Activity:1 (total 3 hours)

Students should be split into two groups:

Step 1 - Each student should visit the library

Step 2 - One group of Students should do the literature review of plants used in the treatment of *Thottra noigal* (non-communicable diseases) from various texts (1 Hour)

Step 3 - Students should collect the Pharmacological activities data of the plants from Publications, Articles, Journals, etc... (1 Hour) Step 4 - Students should organize all the collected information and should submit as an assignment/ project. (1 Hour) Activity 2 (total 3 hours) Step 1 - Another group of Students should do the literature review of plants used in the treatment of Sports and marital art injuries from various texts. (1 Hour) Step 2 - Students should collect the Pharmacological activities data of the plants from Publications, Articles, Journals, etc... (1 Hour) Step 3 - Students should organize all the collected information and should submit as an assignment/ project. (1 Hour)	
Experiential-Learning 12.4 : Literature Review on Single Herbal medications for Skin Diseases	
Total Hours: 5 Hours Step 1 - Each student should visit the library Step 2 - Students should do the Literature review of plants used in the treatment of <i>Thoal noigal</i> (Skin diseases) from various texts (1 1/2 hours) Step 3 - Students should collect the Pharmacological activities data of the plants from Publications, Articles, Journals, etc. (1 1/2 hours) Step 4 - Students should find the names of medicines pertaining to the plant for the particular diseases.(1 1/2 hour) Step 5 - Students should organize all the collected information and should submit as an assignment. (30 mins)	
Experiential-Learning 12.5 : Literature review of Medicinal plants used for Opthal and ENT	
Total Hours 6 Hours Step 1 - Each student should visit the library Step 2 - Students should do the literature review of plants used in the treatment of <i>Kaathu noigal</i> (Ear diseases), <i>Mooku noigal</i> (Nasal diseases), <i>Thondai noigal</i> (Throat diseases) and <i>Kann noigal</i> (Eye diseases) from various texts. (3 Hours) Step 3 - Students should collect the Pharmacological activities data of the plants from Publications, Articles, Journals, etc. (1 Hour) Step 4 - Students should find the herbal formulations pertaining to particular diseases. (1 Hour) Step 5 - Students should organize all the collected information and should submit as a project. (1 Hour)	
Modular Assessment	
Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks. 1. Assignment - (10 Marks)	4

Each student should be assigned One Plant or Raw drug.
 Asked to collect and compile various Traditional and Therapeutic uses in *Siddha* and other AYUSH system of medicine, veterinary medicine.
 Explore the Phytoconstituents, Pharmacological research and submit the assignment.

2. Multiple Choice Questions - (10 Marks)
 Total of 20 Questions
 Each question carries 0.5 Marks

3. Assessment on clinical knowledge -(15 Marks)
 Ask direct questions to assess the knowledge about the plants used for various diseases from various literatures and recall the medicinal uses of plants – 10 marks
 Viva voce on basic knowledge on 6 tastes, 3 humors and body constituents in selecting the medicinal plant for treatment – 5 marks

4. Quiz from units 1- 5 (15 Marks)
 (Students shall divided in 2 groups. Each group shall assign with a group code. Each group shall be asked with a question and the score should be recorded based on the answer).
 The structure of the quiz shall be as follows
 i) Rapid Fire Question
 ii) Question with multiple choice
 iii) Visual and Audio based questions

OR
 Any practical in converted form can be taken for assessment. (25 marks)
 And
 Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 marks)
 S-LAQ, VV-Viva, T-OBT

Semester No : 5

Module 13 : Analytical standardization of herbal drugs

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe the Herbal Standardization parameters - Physicochemical analysis, Phytochemical analysis, Instrumental analysis and shelf-life study with guidelines.

Conduct the Practical on Physicochemical, phytochemical and Instrumental parameters.
Analyse the results of Physicochemical, Physicochemical, phytochemical and Instrumental parameters.

M 13 Unit 1 Physicochemical parameters of herbal powder/Chooranam

13.1.1. Description (*Chooranam* - powder) 13.1.2. Particle size 13.1.3. Loss on drying 13.1.4. Total Ash 13.1.5. Acid insoluble ash 13.1.6. Water soluble extractive 13.1.7. Alcohol soluble extractive, 13.1.8. n-Hexane soluble extractive (Soxhlet method) 13.1.9. pH 13.1.10. Volatile oil content 13.1.11. Foreign matter

References: 120,197,254

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe the physicochemical parameters of herbal <i>chooranam</i>	2	Lecture	CC	Knows-how	L_VC,L&GD,L
CO3,CO7,CO8	Analyse the physicochemical parameters of <i>Chooranam</i> in a drug testing laboratory	4	Practical Training 13.1	PSY-GUD	Shows-how	DA,DL
CO3,CO7,CO8	Review the functioning of instruments in Drug testing laboratory.	6	Experiential-Learning 13.1	CK	Does	ML,DIS,DL,JC,LS

M 13 Unit 2 Physicochemical parameters of plant derived additives oil/resin/sugar/jaggery/Gum

13.2.1. Acid value 13.2.2. Saponification value 13.2.3. Iodine value 13.2.4. Peroxide value 13.2.5. Rancidity 13.2.6. Refractive index 13.2.7. Specific gravity 13.2.8. Reichert Meissl value 13.2.9. Polenske value 13.2.10. Viscosity 13.2.11. Melting point 13.2.12. Congealing point 13.2.13. Estimation of sugar (reducing/total) 13.2.14. Optical rotation

References: 120

3A	3B	3C	3D	3E	3F	3G
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CO3,CO7,CO8	Describe the classification of physicochemical parameters of oil / resin / sugar / jaggery / gums	2	Lecture	CC	Knows-how	L,L&PPT
CO3,CO7,CO8	Analyse the physicochemical parameters of plant derived products - Oil/resin/sugar/jaggery/gum.	5	Practical Training 13.2	PSY-GUD	Shows-how	D,DL
CO3,CO7,CO8	Visit a vegetable oil manufacturing unit.	4	Experiential-Learning 13.2	CC	Does	FV

M 13 Unit 3 Phytochemical assays

13.3.1. Quantitative phytochemical assays for the following
 Flavonoids 13.3.1.6. Coumarins 13.3.1.7. Alkaloids 13.3.1.8. Saponins 13.3.1.9. Proteins 13.3.1.10. Plant acids 13.3.1.11. Glycosides
 13.3.1.12. Quinones 13.3.1.13. Anthraquinones

13.3.1.1. Phenols 13.3.1.2. Tannins 13.3.1.3. Triterpenes 13.3.1.4. Steroids 13.3.1.5.

References: 81

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe the methods for quantitative estimation of phytochemicals.	2	Lecture	CC	Knows-how	L&PPT ,L,BL
CO3,CO7,CO8	Demonstrate quantitative estimation of the phytochemicals	4	Practical Training 13.3	PSY-GUD	Shows-how	DA,SDL, DL
CO3,CO7,CO8	Document of review on Phytochemicals.	5	Experiential-Learning 13.3	CS	Does	SDL,C_L, PL,LS

M 13 Unit 4 Plant Identification Test through Instrumental analysis

13.4.1. Thin layer chromatography identity test (TLC) 13.4.2. High Performance Thin Layer Chromatography identity test (HPTLC) 13.4.3. Gas Chromatography identity tests (GC) 13.4.4. Plant identification software and databases

References: 41,192

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe how instrumental analysis is employed in conducting the Plant Identification Test.	2	Lecture	CC	Knows-how	L&PPT, L_VC, L
CO3,CO7,CO8	Perform the identity test on the plant material using Thin Layer Chromatography.	3	Practical Training 13.4	PSY-MEC	Shows-how	DA,SDL, DL
CO3,CO7,CO8	Prepare the report on TLC identification of plants, interpret the results in comparison with literature and deliver a lecture using power point	5	Experiential-Learning 13.4	CAN	Does	L&PPT, LRI, PER

M 13 Unit 5 Shelf life study and Guidelines

13.5.1. Shelf life and its importance 13.5.2. Factors affecting shelf life of herbal products 13.5.3. Pathogens associated with medicinal plants 13.5.4. Different methods to detect mycotoxin 13.5.5. Decontamination techniques 13.5.6. Equipment - Stability Chamber 13.5.7. Guideline of International Council for Harmonisation (ICH) 13.5.8. Quality Standards 13.5.9. Good storage practice (GSP)

References: 258

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe the Comprehensive study on shelf life: its importance, influencing factors and guidelines.	2	Lecture	CC	Know	DIS, L, L&PPT
CO3,CO7,CO8	Identify Aflatoxins by TLC using FSSAI methods	4	Practical Training 13.5	PSY-GUD	Shows-how	DA, DL
CO3,CO7,CO8	Visit to Microbiology Lab for testing the microbial load of plants.	6	Experiential-	PSY-	Does	SDL, FV,

			Learning 13. 5	GUD		DL,D
Practical Training Activity						
Practical Training 13.1 : Determination of the Physicochemical Parameters of <i>Chooranam</i>						
Students should determine the physicochemical parameters as per procedures in a lab. Students should be divided into two groups and practical should be done in groups. 1. Determine Particle size, pH and Acid insoluble Ash (2 Hours) 2. Determine the Loss on drying, Water/ Alcohol soluble extractive, n-Hexane soluble extractive (Soxhlet method) (2 Hours)						
Practical Training 13.2 : Determination of physicochemical parameters of plant derived products.						
Total Hours : 5 Hours Step 1 - Students should divided into two groups and practical should be done in groups. Step 2 - Students are required to do Rancidity, Refractive index, Specific gravity, Viscosity, Melting point, Congealing point, Optical rotation (2 hours) Step 3 - Students are required to do Reichert Meissl value, Polenske value (2 hours) Step 4 - Student should interpret the results and submit as an assignment (1 hour)						
Practical Training 13.3 : Practicals on quantitative estimation of phytochemicals						
Total Hours: 4 Hours Step 1 - Students should be divided into two groups. Each group should carry out any different quantitative assay for the following 1. Total Phenol content (TPC) by Folin's phenol reagent Method/ Total tannin content by Folin ciocalteu Method (1 1/2 hours) 2. Total Flavonoid estimation by Aluminum Chloride Method/Total alkaloid estimation by Dragendroff's method (1 1/2 hours) Step 2 - Students should estimate the content of phytochemicals by using UV- visible Spectrophotometer (45 mins) Step 3 - Students should interpret the results by plotting the absorbance values on the standard curve and determining the corresponding concentration and submit as record. (15 mins)						
Practical Training 13.4 : Plant identification by Thin Layer Chromatography.						

Total Hours: 3 Hours

Step 1 - Student should extract the plant material using suitable solvent for sample preparation. (20 mins)

Step 2 - Students should use aluminum TLC plates pre-coated with Silica Gel 60 F254 for plate preparation. (20 mins)

Step 3 - Student should spot the plant extract onto the TLC plate using a capillary tube. (40 mins)

Step 4 - Place the plate in a TLC chamber with a suitable mobile phase (solvent system). (40 mins)

Step 5 - Observe the plate under UV light (254 or 366 nm) and dip it in a suitable derivatizing agent to enhance spot visibility. (30 mins)

Step 6 - Student should record the number of spots and the calculated R_f values. (30 mins)

Practical Training 13.5 : Identification of Aflatoxins by TLC (FSSAI Method).

Total Hours: 4 Hours

Students should perform the aflatoxin identification test of by TLC in peanuts/corn using FSSAI method

Step 1 - Students should perform manual TLC to identify aflatoxins on a TLC plate

Step 2 - Students should extract the plant material using a suitable solvent (45 mins)

Step 3 - Students should apply the extract onto the TLC plate using a capillary (1 hour)

Step 4 - Students should develop the TLC plate in the mobile phase (1 hour)

Step 5 - Students should visualize the plate under UV light and record the presence or absence of spots corresponding to aflatoxins B₁, B₂, G₁, and G₂ (30 mins)

Step 6 - Students should interpret the results and submit as record (45 mins)

Experiential learning Activity

Experiential-Learning 13.1 : Instrumental analysis in Drug Testing Lab.

Total Hours: 6 Hours

Step 1 - Students should collect the Standard Operating Procedures of the instruments in the Drug Testing lab from Pharmacopoeia/ from Library (1 1/2 hours)

Step 2 - Students should visit the Drug testing lab and visualize the functioning of the instruments in the Drug testing lab (2 hours)

Step 3 - Students should have the discussion. (1 hour)

Step 4 - Submit as an assignment (1 1/2 hours)

Experiential-Learning 13.2 : Different methods of extraction of vegetable oil, purification processing methods

Total Hours: 4 Hours

Students should visit a vegetable oil manufacturing unit Step 1 - Students should observe the various extraction methods demonstrated in the unit. (2 1/2 hours) Step 2 - Students should also write down the purification methods if any, adapted in the unit and submit the report (1 1/2 hours)	
Experiential-Learning 13.3 : Preparation of chart on phytochemicals	
Total Hours: 5 Hours Step 1 - Students should be assigned specific phytochemicals to study. Step 2 - Students should visit the library to consult various pharmacopeias and thesis records. (2 hours) Step 3 - Students should collect and document information about plants rich in the assigned phytochemicals. (1 hour) Step 4 - Students should gather data on the medicinal applications of these phytochemicals. (1 hour) Step 5 - Students should prepare a chart highlighting phytochemical-rich plants and their uses. (1 hour)	
Experiential-Learning 13.4 : Preparation of test report on TLC	
Total Hours: 5 Hours Step 1 - Student should prepare a report on plant identification by TLC based on the interpretation of results obtained during practical sessions. (1 hour) Step 2 - Students should evaluate the results by comparing them with existing literature. (1 hour) Step 3 - Students should prepare a PPT on the TLC test, results, and literature comparison. (2 hours) Step 4 - Students will present a PowerPoint lecture followed by a group discussion. (1 hour)	
Experiential-Learning 13.5 : Methods of testing the microbial load of plants	
Total Hours: 6 Hours Students should visit the microbiology lab to learn microbial testing methods, observe media and culture preparation procedures, pre-incubate specimens appropriately and study colony-counting techniques. Step 1 - Identify microorganisms using a microscope (2 1/2 hours) Step 2 - Observe the microbial load on a plant sample. (2 1/2 hours) Step 3 - Students should observe the outcomes and document their findings. (1 hour)	
Modular Assessment	
Assessment method	Hour
	4

Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks.

1. Objective structured practical examination (25 marks)

- i) Student will be assessed for the practical skill on the quantitative assay of total phenol/tannin/flavonoid/alkaloid - 15 Marks.
- ii) Student will be assessed for the theoretical knowledge on the quantitative assay of total phenol/tannin/flavonoid/alkaloid - 5 Marks
- iii) They will be questioned on the procedure – 5 Marks

2. Class presentation (10 marks)

- i) Power point preparation in any one of the experiential learning topics - 5 Marks
- ii. For Lecture through power point presentation - 5 Marks

3. Mini Project (15 marks)

- i. Student will run a hand TLC for identification of plant - 5 marks
- ii. Student will write down the procedure for the practical – 5 Marks
- iii. They will be questioned on the procedure – 5 Marks

(or)

Any practical in converted form can be taken for assessment. (25 marks)

and

Any experiential, such as portfolios/reflections/presentations can be taken as an assessment.(25 marks)

Module 14 : Phytochemicals / Phytopharmaceuticals, Chromatographic techniques for isolation and Bioinformatics

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe the phytopharmaceuticals along with their extraction and separation techniques, chromatographic and spectroscopic analyses and molecular docking studies.

Conduct the practical on analysis of phytochemicals.

Identify the working principles of instruments, phytopharmaceutical monographs and compilation of docking studies.

M 14 Unit 1 Essence of phytopharmaceuticals

14.1.1. List of proven Phytopharmaceuticals and their therapeutic uses 14.1.1.1. Atropine 14.1.1.2. Caffeine 14.1.1.3. Cocaine 14.1.1.4. Ginkgolides 14.1.1.5. Ginsenosides 14.1.1.6. Podophyllotoxin 14.1.1.7. Artemisinin 14.1.1.8. Digoxin 14.1.1.9. (L)-dopa 14.1.1.10. Diosgenin 14.1.1.11. Embelin 14.1.1.12. Plumbagin 14.1.1.13. Morphine 14.1.1.14. Vincristine 14.1.1.15. Vinblastine 14.1.1.16. Emetine 14.1.1.17. Ephedrine 14.1.1.18. Berberine 14.1.1.19. Silymarin 14.1.1.20. Quinine 14.1.1.21. Colchicine 14.1.1.22. Vasicine 14.1.1.23. Andrographolide 14.1.1.24. Piperine 14.1.1.25. Artemisinin 14.1.1.26. Curcumin 14.1.1.27. Alliin 14.1.1.28. Resveratrol 14.1.1.29. Arjunolic acid 14.1.1.30. Reserpine, etc. 14.1.2. Regulatory aspects Phytopharmaceuticals

References: 258

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Demonstrate the phytopharmaceuticals and its regulatory bodies.	2	Lecture	CC	Knows-how	BL,L&G D,L&PPT ,L
CO3,CO7,CO8	Prepare one Phytopharmaceutical rich fraction from a plant.	4	Practical Training 14.1	PSY-MEC	Shows-how	LRI,D,DL
CO3,CO7,CO8	Collect a monograph of a phytopharmaceutical from a legal document.	4	Experiential-Learning 14.1	CS	Does	PAL,PER ,DIS,C_L, LS

M 14 Unit 2 Extraction Techniques

14.2.1. Conventional methods - Description, advantages and limitations. 14.2.1.1. Cold percolation / maceration 14.2.1.2. Infusion 14.2.1.3. Decoction 14.2.1.4. Refluxing 14.2.1.5. Digestion 14.2.1.6. Hydro distillation etc. 14.2.2. Non - conventional methods - Description, advantages and limitations. 14.2.2.1. Super critical fluid extraction method 14.2.2.2. Microwave-assisted extraction (MAE) 14.2.2.3. Ultrasound-assisted extraction (UAE) or sonication 14.2.2.4. Enzyme-assisted extraction 14.2.2.5. Pulsed electric field (PEF) assisted extraction 14.2.2.6. Pressurized liquid extraction (PLE) etc.

References: 165

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe about various extraction methods.	2	Lecture	CAP	Knows-how	L_VC,L&GD
CO3,CO7,CO8	Perform the Extraction of Phytoconstituents from plants by various extraction methods.	4	Practical Training 14.2	PSY-GUD	Shows-how	PrBL,DL,D
CO3,CO7,CO8	Visit to Herbal extraction unit/pharmaceutical industry for large-scale plant extraction	6	Experiential-Learning 14.2	PSY-MEC	Does	RLE,SDL,FV

M 14 Unit 3 Separation methods

14.3.1. Physical techniques 14.3.2. Types and Terminologies in Chromatography 14.3.3. High Pressure Liquid Chromatography(HPLC)

References: 165

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe about various separation methods.	2	Lecture	CC	Knows-how	L&PPT , DIS,L,L_VC
CO3,CO7,CO8	Perform Physical and Chromatographic separation techniques	4	Practical Training 14.3	PSY-GUD	Shows-how	DL,D
CO3,CO7,CO8	Visit a laboratory equipped with an HPLC (High-Performance Liquid Chromatography) instrument.	6	Experiential-Learning 14.3	PSY-MEC	Does	D-M,DL,SDL,FV

M 14 Unit 4 Instrumental Techniques for Phytopharmaceutical characterization

14.4.1. Infrared Spectroscopy (IR), 14.4.2. UltraViolet -Visible spectroscopy (UV-Vis), 14.4.3. Gas Chromatography - Mass Spectrometry (GC-MS), 14.4.4.

Nuclear Magnetic Resonance Spectroscopy (NMR), 14.4.5. Mass Spectroscopy (MS)

References: 165

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Describe about various Instrumental Techniques for Phytopharmaceutical characterization.	2	Lecture	CC	Knows-how	L,L&PPT ,L&GD
CO3,CO7,CO8	Identify the Phytochemicals by UV spectra.	4	Practical Training 14.4	PSY-MEC	Shows-how	D,DL
CO3,CO7,CO8	Visit a laboratory equipped with a GC-MS (Gas Chromatography-Mass Spectrometry) instrument.	6	Experiential-Learning 14.4	PSY-MEC	Does	FV,DIS,D L,SDL

M 14 Unit 5 Computational Docking Techniques

14.5.1. Introduction to *in silico* docking study 14.5.2. Types and various methods of docking study 14.5.3. Docking software and popular docking tools 14.5.4. Applications of docking in new drug discovery 14.5.5. Applications of chemical drawing software tool and types

References: 259

3A	3B	3C	3D	3E	3F	3G
CO3,CO7,CO8	Discuss about the computational techniques for docking.	2	Lecture	CC	Knows-how	L&GD,L &PPT ,D
CO3,CO7,CO8	Draw chemical structures using Chem Draw software.	4	Practical Training 14.5	CAP	Shows-how	D-M,C_L
CO3,CO7,CO8	Compile the articles on docking studies in different activities	4	Experiential-Learning 14.5	AFT-CHR	Does	JC,C_L,T BL,DIS, ML

Practical Training Activity

Practical Training 14.1 : Phytopharmaceutical extraction.

Total Hours : 4 Hours

Step 1 - Students should do the extraction of phytopharmaceutical from an assigned plant.

Step 2 - Students should extract the plant with suitable solvent (40 mins)

Step 3 - Students should distil the solvent after extraction (40 mins)

Step 4 - Students should run the column and elute with solvents using column chromatography (50 mins)

Step 5 - Students should collect the fractions and check the purity by TLC (1 1/2 hours)

Step 6 - Student should note the number of spots and calculate the R_f values and keep it on record (20 mins)

Practical Training 14.2 : Extraction of phytoconstituents.

Total Hours: 4 Hours

Students should be divided into two or three groups and extract the phytoconstituents using different extraction methods.

Step 1 - Students should reflux the plants with solvents over a water bath, filter the extract and distill out the solvent. Record the yield of extract (1 hour)

Step 2 - Students should digest the plants with solvents in a sonicator, filter the extract and distill out the solvent. Record the yield of extract (1 hour)

Step 3 - Students should perform the Soxhlet extraction with a solvent, distil it and record the yield (1 hour)

Step 4 - Student should extract the essential oil using a Clevenger's apparatus and record the yield of essential oil (1 hour)

Practical Training 14.3 : Conventional and chromatographic separation techniques.

Total Hours: 4 Hours

Step 1 - Students should do practical on different separation techniques and purify the given sample individually or in groups.

Step 2 - Student should do physical separation like winnowing, hand picking, sieving, sublimation, filtration, evaporation, etc. and determine the yield of separated materials (30 mins)

Step 3 - Student should do chromatographic separation like winnowing, hand picking, sieving, sublimation, filtration, evaporation, etc. and determine the yield of separated materials (3 ½ hours)

Practical Training 14.4 : Identification of phytochemicals by UV absorption spectra.

Total Hours: 4 Hours

Step 1 - UV absorption spectra of phytochemicals such as gallic acid, quercetin, ascorbic acid, curcumin, embelin, etc. will be individually assigned to students.

- Step 2 - Students should take the absorption spectra of the given Phytochemical solution (2 hours)
- Step 3 - Students should identify the Phytochemical by comparison with literature UV absorption value (2 hours)

Practical Training 14.5 : Usage of chem Draw and Docking software.

Total Hours: 4 Hours

Students should be individually assigned with any phytochemicals.

- Step 1 - Students should collect the correct structures of phytochemicals from literature. (1 hour)
- Step 2 - Students should draw two structures each from any five categories of phytochemicals such as flavonoid, triterpene, alkaloid, glycoside, tannins, etc . (1 hour)
- Step 3 - Hands on experience for docking exercises using software. (30 mins)
- Activity 2:
- Step 1 - Students should install AutoDock tools & then prepare the plant protein (receptor) and ligand. (30 mins)
- Step 2 - Students should set grid parameters, run the docking simulation & analyse binding interactions and energies. (30 mins)
- Step 3 - Students should carry out validation and further optimization. (30 mins)

Experiential learning Activity

Experiential-Learning 14.1 : Compilation of Monographs for a Phytopharmaceutical

Total Hours: 4 Hours

- Step 1- Students should individually asked with selecting one phytopharmaceutical. (30 mins)
- Step 2- Students should visit the library, where legal documents such as the Indian Pharmacopoeia are available. (1 hour)
- Step 3- Students should gather the relevant legal documents and prepare a detailed monograph of their chosen phytopharmaceutical. (2 hours)
- Step 4- Students should submit their work as an assignment and deliver a presentation. (30 mins)

Experiential-Learning 14.2 : Visualization of Herbal extraction

Total Hours: 6 Hours

- Step 1- Students should observe the large-scale extraction methods of *Satthu*. (1 hour)
- Step 2- Students should know the different drying techniques such as freeze drying/spray drying/ steam drying/etc . (2 hours)
- Step 3- Students should prepare the report on the visit including extraction methods for a specific plant and data from other pharma industries. (2 1/2 hours)
- Step 4- Students should submit the record. (30 mins)

Experiential-Learning 14.3 : Field visit to an HPLC instrument in a Quality Control (QC) or Research Laboratory.

Total Hours: 6 Hours Step 1- Students should visit the lab and know the HPLC-instrumentation, working principal, various detectors and columns, etc. (2 hours) Step 2- Students should learn how to develop a method for the qualitative analysis of plant extracts using HPLC. (3 hours) Step 3- Students should maintain a record of observed method and results. (1 hour)	
Experiential-Learning 14.4 : Field visit to an GC-MS (Gas Chromatography-Mass Spectrometry) instrument analysing lab	
Total Hours: 6 Hours Step 1- Students should visit the lab and know the GC-MS-instrumentation, working principal, various detectors and columns, etc. (2 hours) Step 2- Students should learn how to develop a method for the qualitative analysis of plant extracts using GC-MS. (3 hours) Step 3- Students should maintain a record of observed method and results. (1 hour)	
Experiential-Learning 14.5 : Compilation of research articles on docking studies	
Total Hours: 4 Hours Activity 1: Step 1- Students should be instructed to select a specific pharmacological activity and collect relevant docking study data from research papers. (2 hours) Step 2- Students should gather all available online data pertaining to the selected activity. (1 1/2 hours) Step 3- Students should keep record and submit the collected data. (30 mins)	
Modular Assessment	
Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks 1. Objective structured Practical Examination (25 marks) i) Student will be observed and assessed for handling of instruments/glassware for effective execution skill in all practicals - 5 Marks. ii) Student will be evaluated for the understanding of principle behind every practicals through write on experimental procedure/ observation/ inference/results/calculation/presentation - 5 Marks iii) Practical record maintenance – 5 Marks iv) Viva on each practical – 10 Marks	4

2. Assignment (10 marks)

Submit an assignment on chromatographic and spectroscopic analyses and molecular docking studies. - 10 Marks

3. Mini project (15 marks)

Students will be assigned one plant and conduct molecular docking study. - 15 Marks

or

Any practical in converted form can be taken for assessment. (25 marks)

and

Any experiential, such as portfolios/reflections/presentations can be taken as an assessment.(25 marks)

Semester No : 6

Module 15 : Herbs used in Siddha Dietetics

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe the *Unave marunthu -Marunthe unavu* (Food is medicine, Medicine is Food), Fundamental concepts of herbs used in Siddha Dietetics, Regulations of Food Safety and Standards Authority of India (FSSAI)

Conduct the analysis of Herbal food

Identify the traditional Millet & Paddy varieties

M 15 Unit 1 Food is medicine, Medicine is Food

15.1.1. Fundamental concepts of herbs used in Siddha Dietetics 15.1.2. Classification of Food based on Siddha principles 15.1.3. Herbs used in Traditional Food recipes in preventing Lifestyle disorders 15.1.4. Herbs used in *Pathiyam* (diet regimen) for diseases and selected medicines 15.1.5. Role & Responsibilities of Food Safety and Standards Authority of India (FSSAI)

References: 137

3A	3B	3C	3D	3E	3F	3G
CO2,CO6	Describe <i>Unave Marunthu Marunthe Unavu</i> - fundamental concepts, Dietary regimen and FSSAI regulations.	2	Lecture	CC	Knows-how	LS,L,L&GD,L&PPT
CO3,CO6,CO8	Prepare Novel foods for non-communicable diseases.	4	Practical Training 15.1	PSY-MEC	Shows-how	DL,BS,D,ML
CO6,CO7,CO8	Conduct a visit to the National Food Laboratory (NFL) to collect data on Siddha food supplements used in managing lifestyle disorders.	6	Experiential-Learning 15.1	CS	Does	DL,SDL,PER,FV,RLE

M 15 Unit 2 Unavagum thavarangal (Plants as food)

15.2.1. Siddha aspects and Therapeutic properties of Edible herbs 15.2.1.1. *Ver* (root) 15.2.1.2. *Kizhangu* (tuber) 15.2.1.3. *Samoolam* (Whole plant) 15.2.1.4. *Thandu* (Stem) 15.2.1.5. *Kai* (vegetable) 15.2.1.6. *Kani* (Fruit) 15.2.1.7. *Malar* (Flower) 15.2.1.8. *Keeraigal* (Greens) 15.2.1.9. *Vithaigal* (Seeds and Legumes) 15.2.2. Spices

References: 119,137

3A	3B	3C	3D	3E	3F	3G
CO3,CO6,CO7	Describe the <i>Unavagum Thavarangal</i> (Dietary herbs).	2	Lecture	CC	Knows-how	L&PPT , L&GD,DIS,L
CO6	Prepare and find out the calorific value of traditional sweets with cane/palm jaggery/Candied Fruits / Palm candy	4	Practical Training 15.2	PSY-GUD	Shows-how	Mnt,DL,DA,D,TPW
CO3,CO6,CO7,CO8	Compile the medicinal properties of Unavagum Thavarangal used in traditional food and hospital kitchens.	4	Experiential-Learning 15.2	AFT-REC	Does	DIS,FV,RLE,JC,LS

M 15 Unit 3 Herbal food rich in Antioxidants

- 15.3.1. Recommended Dietary Allowance (RDA) and Food exchange list
- 15.3.2. Organic Foods and Functional foods
- 15.3.3. Antioxidant rich foods/ Anti aging foods
- 15.3.4. Fibre rich foods
- 15.3.5. Scope for the development of food

References: 119

3A	3B	3C	3D	3E	3F	3G
CO5,CO6	Discuss Herbal foods rich in Antioxidants.	2	Lecture	CAP	Knows-how	L&PPT , LS,L&G D,L
CO4,CO5,CO6	Perform Antioxidant assay by DPPH (2,2-diphenyl-1-picrylhydrazyl) method in Herbal foods.	2	Practical Training 15.3	PSY-GUD	Shows-how	DL,D,DA ,TPW
CO2,CO6,CO8	Visit a food analysis lab to observe the ORAC (Oxygen Radical Absorbance Capacity) in antioxidant potential of foods.	5	Experiential-Learning 15.3	AFT-SET	Does	DL,D,DIS ,FV,TPW

M 15 Unit 4 Ootachathu Mooligai-Siddha Nutraceuticals

- 15.4.1. Study on *Siruthaniyangal* (Millets) and *Navathaniyangal* - Siddha Pharmacological aspects, Nutritive Values 15.4.1.1. *Siruthanium* 1. *Kuthiraivaali* - *Echinochola frumentacea* 2. *Kambu* - *Pennisetum glaucum* 3. *Kezhvaragu* - *Eleusine coracona* 4. *Saamai* - *Panicum sumatrense* 5. *Cholam* - *Sorghum vulgare* 6. *Thinai* - *Setaria italica* 7. *Makkacholam* - *Zea mays* 8. *Varagu* - *Paspalum scrobiculatum* 9. *Panivaraku* - *Panicum miliaceum* 10. *Seethai Korai* - *Brachiaria ramosa* 15.4.1.2. *Navathaniam* 1. *Gothumai* - *Triticum aestivum* 2. *Nellu* - *Oryza sativa* 3. *Ellu* - *Sesamum indicum* 4. *Payaru* - *Vigna radiata* 5. *Kollu* - *Macrotyloma uniflorum* 6. *Ullundu* - *Vigna munga* 7. *Mochai* - *Lablab purpureus* 8. *Thuvarai* - *Cajanus cajan* 9. *Kondaikadalai* - *Cicer arietinum* 15.4.2. Status of nutritional food in international scenario 15.4.3. Nutrition and Siddha medicine in lifestyle disorders and various diseases 15.4.4. Role of Fermented foods in promoting Gut health 15.4.5. Nutritive value of *Spirulina* - *Arthrospira platensis*

References: 119,137

3A	3B	3C	3D	3E	3F	3G
CO6	Enumerate and elucidate the Siddha Nutraceuticals.	2	Lecture	CC	Knows-how	DIS,L&PPT ,L,BL, L&GD
CO6	Perform Proximate analysis (Basic nutritional composition) for Siddha Nutraceuticals (<i>Siruthaniyangal / navathaniyangal</i>)	4	Practical Training 15.4	PSY-GUD	Shows-how	D,SDL,D A,C_L,D L
CO6,CO8	Assess the underlying causes of lifestyle disorders & evaluate the nutritional and therapeutic benefits of millets in managing these conditions.	5	Experiential-Learning 15.4	AFT-VAL	Does	JC,TPW, LS,DIS,M L

M 15 Unit 5 Parambaria Nel (Paddy) and other alternative functional grains

15.5.1. Siddha aspects of Nel (Paddy) as per *Gunapadam mooligai* text 1. *Kaar* 2. *Manakaththai* 3. *Vaalaan* 4. *Karunkuruvai* 5. *Eerkkuchamba* 6. *Puzhuguchamba* 7. *Koraichamba* 8. *Kurunchamba* 9. *Milaguchamba* 10. *Seeraga chamba* 11. *Kaalan chamba* 12. *Mai chamba* 13. *Kodaichamba* 14. *Kaadaichamba* 15. *Malligaichamba* 16. *Iluppaipoo chamba* 17. *Mani chamba* 18. *Valaithadichamba* 19. *Kaivaraichamba* 20. *Senchamba* 21. *Kallundai chamba* 22. *Kunduchamba* 23. *Kundrimani chamba* 24. *Annamazhagi* 15.5.1.1. Properties of rice 15.5.1.2. Types 15.5.1.3. Porridge varieties 15.5.1.4. *Ner pori* (Puffed rice) 15.5.1.5. Rice flour and its uses 15.5.2. *Parambaria Arisi* (rice) , Medicinal importance of the listed *Arisi* 1. *Black kavuni* 2. *Poongar* 3. *Sithu kothirai* 4. *Thuya malli* 5. *Mapillai samba* 6. *Kizhavan samba* 7. *Kaatu yaanam* 8. *Karudan samba* 9. *Kuda vaazhai* 10. *Kodu mani* 11. *Navara arisi* 12. *Kichilli samba* 13. *Sivappu Kavuni* 14. *Ponni* 15. *Thanga samba* 15.5.2.1 Aromatic Rice Varieties - Basmati rice, Jasmine rice 15.5.3. Other functional alternative grains and their nutritional values 15.5.3.1. *Moongil Arisi* (Bamboo Rice) 15.5.3.2. Extraction and preparation of Sago grains (*Cycas revoluta*) 15.5.3.3. Red Yeast Rice (*Monascus purpureus*) 15.5.3.4. Quinoa Rice (seeds)-*Chenopodium quinoa* 15.5.3.5. Pseudocereals - Amaranth, Buckwheat, Chia seeds

References: 119

3A	3B	3C	3D	3E	3F	3G
CO2,CO6	Classify <i>Parambaria Unavugal</i> (Traditional Foods)	2	Lecture	CAP	Knows-how	L,L&PPT ,DIS,L&

						GD
CO6	Analyze glycemic index (GI) of the <i>Parambariya nel/arisi vagaigal</i> .	6	Practical Training 15.5	PSY-GUD	Shows-how	SIM,DA, D,DL,JC
CO2,CO6,CO8	Compile the medicinal values of <i>Parambariya nel</i> (traditional paddy) varieties	6	Experiential-Learning 15.5	AFT-VAL	Does	ML,TBL, JC,LS

Practical Training Activity

Practical Training 15.1 : Formulation of innovative food items

Total Hours: 4 Hours

Step 1 - Students will be entrusted individually to create novel food recipes for any one non communicable disease.

Step 2 - Students will select a non - communicable disease . (30 mins)

Step 3 - Students will prepare novel food recipes for the selected non -communicable disease. (2 hours)

Step 4 - Students will calculate the nutritional value based on the ingredients/nutrient taken from data base, peer reviewed journal (1 hour)

Step 5 - Students will submit as a report along with the prepared food (30 mins)

Practical Training 15.2 : Calorific value of traditional sweets/Candied Fruits

Total hours - 4 hours

Step 1 - Students should prepare the traditional sweet with cane/palm jaggery / Candied Fruits / Palm candy / *Murappa* (1 hour)

Step 2 - Students should perform the calorific value determination using a Bomb calorimeter in biochemistry lab (2 1/2 hour)

Step 3 - Students should calculate the calorific value of the traditional food and report (30 mins)

Practical Training 15.3 : Antioxidant assay of Herbal foods.

Total Hours: 2 Hours

Step 1 - Student should prepare DPPH Solution as per procedure. (15 mins)

Step 2 - Students should prepare extract from the given food sample under study. (15 mins)

Step 3 - Mix equal volumes of DPPH solution and sample extract in test tubes. (15 mins)

Step 4 - Keep all tubes in the dark at room temperature for incubation. (30 mins)

Step 5 - Student should measure Absorbance using UV-Vi spectrophotometer to read absorbance at 517 nm. (15 mins)

Step 6 - Student should interpret the results by plotting % inhibition vs. concentration to assess antioxidant strength using formula and record it. (30 mins)

Practical Training 15.4 : Proximate analysis of Siddha Nutraceuticals.

Total Hours: 4 Hours

Step 1 - Students will be instructed on the proximate analysis procedure, then divided into groups to prepare the herbal samples for testing. (15 mins)

Step 2 - Each group should assign to do as follows, (3 hours)

- Loss on drying
- Total ash
- Crude fat
- Crude protein
- Crude fibre
- Crude carbohydrate

Step 3 - Students should observe and log the findings. (45 mins)

Practical Training 15.5 : Glycemic index (GI) analysis

Total Hours: 6 Hours

Step 1 - Students should prepare the sample for the In-Vitro GI Procedure. (30 mins)

Step 2 - Students should perform the oral, gastric and intestinal digestion simulation on the study sample as per the procedure. (3 1/2 hours)

Step 3 - Students should do the timed glucose sampling at intervals.

Step 4 - Students should calculate the glycemic index (GI) by Glucometric method and report the values. (2 hours)

Experiential learning Activity

Experiential-Learning 15.1 : Collection of Siddha dietary data for lifestyle disorders at NFL visit

Total hours - 6 hours

Step 1- Students should assigned a specific lifestyle disorder and required to survey the market for available Siddha food supplements. (3 hours)

Step 2 - Students should visit to FSSAI laboratory. (2 hours)
Step 3 - Students should prepare report of the data and submit. (1 hour)

Experiential-Learning 15.2 : Medicinal properties of *Unavagum Thavarangal*

Total Hours - 4 Hours

Step 1- Students should visit a traditional food restaurant and hospital kitchen.
Step 2- Students should collect a list of food preparations and identify the *Unavagum Thavarangal* included. (2 1/2 hours)
Step 3- Students should research the medicinal properties of these ingredients. (1 hour)
Step 4- Students should keep assignment and submit the record. (30 mins)

Experiential-Learning 15.3 : Food Analysis Lab Visit

Total Hours - 5 Hours

Step 1- Students should visit a Food Analysis Lab
Step 2- Students should observe the preparation of reagents, sample extract and chemicals. (1 1/2 hours)
Step 3- Students should watch while performing the assay procedure. (1 1/2 hours)
Step 4 - Students should calculate the ORAC value. (1 hour)
Step 5 - Students should prepare and submit the report for the assigned sample. (1 hour)

Experiential-Learning 15.4 : Life style disorders and millet diet

Total Hours - 5 Hours

Step 1- Students should selecting any lifestyle disorder or their choice. (30 mins)
Step 2- Students should analyze the root cause of the selected lifestyle disorder. (2 hours)
Step 3- Students should collect properties of millets suitable for the disorder. (2 hours)
Step 4- Students should compile millet's nutritive & curative properties and connect them to the disorder's root cause for eradication. (30 mins)

Experiential-Learning 15.5 : Collection of medicinal values of *Parambariya nel* (traditional paddy) varieties

Total Hours - 6 Hours

Step 1- Students should gather information on the cultivation locations, collection methods and identification techniques of traditional paddy varieties. (2 1/2 hours)
Step 2- Students should document the preservation methods, fermentation techniques and medicinal uses of traditional paddy varieties, including *Kaadi* (rice vinegar). (3

hours)

Step 3- Students should submit the collected data. (30 mins)

Modular Assessment

Assessment method

Hour

Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks

4

1. Objective structured Practical Examination (15 marks)

i). Identification of varieties of paddy/ millet spotters - 5 marks (5 spotters- each carries 1 marks)

ii). Identify the low glycemic index rice by practicals using polished rice, unpolished rice or millets - 10 marks

2. Submit as assignment (10 Marks)

3. Mini Project (25 marks)

Visit Paddy Processing Research Centre(PPRC) to acquire traditional knowledge of preserved Nel and submit as mini project - 25 Marks
or

Any practical in converted form can be taken for assessment. (25 marks)

and
Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment.(25 marks)

Module 16 : Recent Trends in Plant Based Applications, Drugs and Cosmetics Act and Magic Remedies Act

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe the recent trends in plant based applications with importance and applications of tissue culture, regulations of Drug & Cosmetics Act and Drug & Magic Remedies act.

Conduct the preparation of Herbal dye, Single Herbal *Parpam*, *Mooligai satthu*.

Identify the methods used in Nano particle synthesis.

M 16 Unit 1 Sustainable Approach to Pigments, Dyes, Flavors, Sweeteners derived from plants

16.1.1. Siddha plant derived eco- friendly dyes in cosmetic industry 16.1.2. Application of plant derived Colorants, Flavors, Sweeteners, Emulsifiers, Preservatives, Essences in food industry 16.1.3. Plant - based ecofriendly alternative fibers and dying in textile industry 16.1.4. Plant - based dyes in pharmaceutical industry 16.1.5. Aromatic oils and their applications

References: 256

3A	3B	3C	3D	3E	3F	3G
CO6,CO7	Discuss the role of plants in producing natural pigments, flavor compounds and sweeteners.	2	Lecture	CC	Knows-how	DIS,L&P PT ,L,L&GD,BL
CO6,CO7	Prepare pigments / dyes / flavors / sweeteners derived from plants	4	Practical Training 16.1	PSY-GUD	Shows-how	DL,D
CO3,CO6,CO7	Visit to agricultural plantations and manufacturing unit to witness natural dyes in the making.	6	Experiential-Learning 16.1	AFT-REC	Does	EDU,SD L,FV

M 16 Unit 2 Application of Plant Extract in Biomaterials- Bio-implants, Bioplastics, Exosomes and Biofuels

16.2.1. Bio-implants 16.2.1.1. Wound healing materials (Cellulose, Chitosan, Alginate) 16.2.1.2. Applications in skin grafts, bone regeneration and dental implant 16.2.1.3. Safety and toxicity of bioimplants 16.2.1.4. Future scope of bioimplants 16.2.2. Bioplastics 16.2.3. Introduction to exosomes and extracellular vesicles 16.2.3.1. Plant derived exosomes: extraction and characterisation 16.2.3.2. Composition of exosomes 16.2.3.3. Applications in therapeutics and cosmetics 16.2.3.4. Advantages and limitations in plant exosome research 16.2.4.Biofuels: Bio-butanol, Biodiesel, Biogas, Bioethanol

References: 257

3A	3B	3C	3D	3E	3F	3G
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CO6,CO7	Describe the advances of Biomaterials in developing bioimplants, exosomes & extracellular vesicles, bioplastics, Biofuels from Phytoextracts and their utilizations.	2	Lecture	CC	Knows-how	L&PPT , DIS,BL,L ,L&GD
CO7,CO8	Prepare bio implant from Plant-based material.	4	Practical Training 16.2	PSY- MEC	Shows-how	D,DL,BL
CO6,CO7,CO8	Collect the data about Phytoexosomes and its scope in the field of Biomedicine and Biotechnology and Antimicrobial assay of Chitosan.	6	Experiential-Learning 16.2	AFT- VAL	Does	BL,LS,D L,BS,ML

M 16 Unit 3 Plant Based Nanotechnology

16.3.1. Nanomedicine 16.3.2. Green Synthesis of Nanoparticles from Siddha Medicinal plants 16.3.2.1. Synthesis of Silver, Gold, Zinc Oxide, Iron Oxide, etc using plants 16.3.2.2. Applications in medicine and targeted drug delivery 16.3.3. Toxicity and biocompatibility of plant - based nanoparticle 16.3.4. Plant - based Nanocosmeceuticals 16.3.5. Plant - based nano pesticides

References: 252

3A	3B	3C	3D	3E	3F	3G
CO5,CO6,CO7,CO8	Discuss the applications of plant-based nanotechnology in detail.	2	Lecture	CAP	Knows-how	L&GD,L, L&PPT ,DIS
CO5,CO6,CO7,CO8	Prepare <i>Mooligai parpam</i> and detect the nanoparticles using SEM-EDX analysis	4	Practical Training 16.3	PSY- GUD	Shows-how	DL,DA,D
CO5,CO6,CO7,CO8	Appraise the knowledge of recent trends of nanoscience in day- to day practice as water purification.	4	Experiential-Learning 16.3	AFT- VAL	Does	SIM,EDU ,SDL,RL E

M 16 Unit 4 Plant Based Collagen and Biologics

16.4.1. Plant based Collagen 16.4.1.1. Sources of Plant based collagen substitutes - Seaweed, Soy protein, bacterial collagen, plant peptides, legumes, whole grains, citrus fruits, garlic. 16.4.1.2. Uses of vegan collagen 16.4.1.3. Extraction and purification techniques 16.4.1.4. Application in cosmetics 16.4.1.5. Biologics with examples and applications 16.4.1.6. Gene expression in plants with examples and applications

References: 91,261

3A	3B	3C	3D	3E	3F	3G
CO5,CO6,CO7,CO8	Describe the plant-based collagen cosmetics using various plant-derived components	2	Lecture	CC	Knows-how	DIS,L,L&GD,L&PPT
CO6,CO8	Prepare Vegan Collagens face mask, UV protection collagen face mask, anti - acne face mask and vegan collagen face wash for cosmetic purpose.	4	Practical Training 16.4	PSY-MEC	Shows-how	D,DL
CO5,CO6,CO7,CO8	Compile about data regarding Collagen used in the Cosmetic Industry	6	Experiential-Learning 16.4	AFT-REC	Does	BS,DIS,FV,BL

M 16 Unit 5 Importance and Applications of Tissue Culture

16.5.1. The International Union for Conservation of Nature (IUCN) Red List 16.5.2. Critically endangered, vulnerable & near threatened plants 16.5.3. Plant Tissue culture and its techniques 16.5.3.1. Applications and advantages 16.5.3.2. Challenges and limitations

References: 255

3A	3B	3C	3D	3E	3F	3G
CO6,CO7,CO8	Describe the importance and application of Plant tissue culture.	2	Lecture	CC	Knows-how	L,DIS,L&PPT ,BL
CO1,CO7,CO8	Prepare the fundamental plant tissue culture experiment.	4	Practical Training 16.5	PSY-GUD	Shows-how	D-M,D,DL
CO1,CO7,CO8	Participate in the exploration of Plant Biotechnology laboratory.	4	Experiential-	PSY-	Does	L,C_L,SD

			Learning 16.5	MEC		L,DIS,FV
Practical Training Activity						
Practical Training 16.1 : Preparation of pigments / dyes / flavors / sweeteners derived from plants						
Total Hours - 4 Hours Step 1 - Students will be divided into groups and assigned to collect herbal plant materials for the extraction of pigments, dyes, flavors, or sweeteners each (30 mins) Step 2 - Students should extract pigment/dye/flavor/sweeter through extraction techniques. (1 1/2 hours) Step 3 - Students should apply these additives to prepare a product like tinir/ perfume/ colorant/ sweetener (1 1/2 hour) Step 4 - Students should provide a documented procedure and keep it on record .(30 mins)						
Practical Training 16.2 : Extraction of Bio implant from plants.						
Total Hours - 4 Hours Students shall be provided with required items for the preparation of chitosan (Bio-implant) extracted from mushroom source and do as follows Step 1 - Pretreatment / cleaning of mushroom with distilled water and dried at 60–70 °C. (15 mins) Step 2 - Deproteinization through soaking mushroom powder with NaOH. (1 hour) Step 3 - Demineralization by treating the residue with HCl. (30 mins) Step 4 – Deacetylation (Chitin to Chitosan) by treating the residue with 40–50% NaOH at 100–120 °C. (1 1/4 hour) Step 5 - Students should prepare a written record of the procedure and its properties for submission .(1 hour)						
Practical Training 16.3 : Preparation and nanoparticle characterization of <i>Mooligai parpam</i>						
Total Hours - 4 Hours Step 1 - Student should prepare assigned <i>Mooligai Parpam</i> in Gunapadam laboratory. (1 hour) Step 2 - Student should develop extract from the prepared sample and make the metal salt solution for simple colorimetric detection. (30 mins) Step 3 - Student should mix the extract with the metal salt solution and stir the solution to observe the color change which indicates the presence of nanoparticles. (30 mins) Step 4 - Students should do the Sample preparation from the prepared <i>Mooligai parpam</i> for SEM analysis coupled with EDX in a research laboratory (30 mins) Step 5 - Students should do the SEM imaging and EDX elemental mapping under guidance. (1 hour) Step 6 - Student should interpret the results and submit as record. (30 mins)						
Practical Training 16.4 : Preparation of Plant-based collagen for any cosmetic purpose.						

Total Hours - 4 Hours

Activity 1- Student should prepare Vegan Collagen Face Mask as follows (Total 1 Hour)

Step 1 - Combine agar-agar and water in a pot; heat and stir until dissolved and thickened. Cool slightly. (30 mins)

Step 2 - Mix aloe vera gel, coconut or jojoba oil, and mashed banana or avocado together. (15 mins)

Step 3 - Pour in the agar mixture, stir to a smooth paste and add essential oil if desired. (15 mins)

Activity 2- Student should prepare UV protection collagen face mask as follows (Total 1 Hour)

Step 1- Boil agar-agar in water until thickened; cool slightly. (30 mins)

Step 2 - Mix aloe vera, seed oil (carrt seed /raspberry seed oil) and mashed fruit (banana or avocado). (15 mins)

Step 3 - Combine with agar gel, add essential oil. (15 mins)

Activity 3 - Student should prepare anti-acne face mask as follows (Total 30 mins)

Step 1- Mix *multani mitti*, neem powder or oil and turmeric powder in a bowl. (15 mins)

Step 2 - Add rose water or honey gradually to form a smooth paste. (10 mins)

Step 3 - Optionally, add a few drops of tea tree oil or lemon juice (5 mins)

Activity 4 - Student should prepare vegan collagen face wash as follows (1 1/2 hours)

Step 1 - Student should take Clean and disinfect a bottle or dispenser. To Transfer the castile soap into the container. (10 mins)

Step 2 - Add aloe vera gel, glycerin, coconut or jojoba oil and vitamin E oil. (30 mins)

Step 3 - Add plant-based collagen booster or peptide serum. (20 mins)

Step 4 - Drop in essential oil (e.g., lavender or tea tree) (15 mins)

Step 5 - Shake gently to mix everything well and Store in a cool / dry place. (15 mins)

Practical Training 16.5 : Experimentation of basic plant tissue culture.

Total Hours - 4 Hours

Step 1 - Student should sterilize the plant material under experiment by soaking the explants into 10-20% bleach (sodium hypochlorite) solution and Rinse explants 3-4 times with sterile distilled water to remove bleach (1 hour)

Step 2 - Student should prepare the culture media (MS medium) prior to the experiment under teacher guidance. (2 hours)

Step 3 - Place explants gently on the surface of sterile culture media under aseptic conditions. (30 mins)

Step 4 - Student should monitor the contamination and observe the explant response for swelling, callus formation, shoot/root initiation regularly.

Step 5 - Student should record the results and submit them as documentation (30 mins)

Experiential learning Activity

Experiential-Learning 16.1 : Educational visit to agricultural plantations and a manufacturing unit

Total Hours - 6 Hours

Step 1 - Student should visit the plantation area (Indigo) and dye preparation unit to know how to prepare herbal dye (2 1/2 hours)

Step 2 - Field visit to a plantation area (Aromatic plants) and Essential oil extraction unit to visualize large scale extraction (3 hours)

Step 3 - Students will submit the field visit as assignment (30 mins)

Experiential-Learning 16.2 : Data collection of Phytoexosomes and its scope in the field of Biomedicine and Biotechnology and Antimicrobial assay of Chitosan.

Total Hours - 6 Hours

Activity 1 (3 hours)

Step 1 - Students should visit/browse library/e-library to collect the data about Phyto exosomes.(30 mins)

Step 2 - Reviewing the details about the sources, components, isolation techniques and applications of exosomes. (2 hours)

Step 3 - Student should document the collected data and submitted as an assignment. (30 mins)

Activity 2 (3 hours)

Antimicrobial assay of Chitosan using Agar Diffusion method in microbiology laboratory to do as follows

Step 1 - Dissolving chitosan in 1% acetic acid may take several hours or overnight for complete dissolution done before the experiment. (30 mins)

Step 2 - Swabbing agar plates with microbial suspension. (15 mins)

Step 3 - Placing discs in chitosan solution (15 mins)

Step 4 - Incubate plates at 37°C (1 hour) (Note: 24-hours incubation followed by next-day observation)

Step 5 - Measure zones of inhibition immediately after incubation. (30 mins)

Step 6 - Student should interpret the results and submit as an assignment. (30 mins)

Experiential-Learning 16.3 : Application of green nano materials in water purification.

Total Hours - 4 Hours

Step 1 - Preparation of contaminated water with specific pollutants (dyes, heavy metals or bacteria) (10 mins)

Step 2- Add green nanomaterials to the contaminated water and stir. (5 mins)

Step 3 - Remove the nanoparticles by passing the treated water through a fine filter paper or membrane (0.2–0.45 µm) (15 mins)

Step 4 - Measure the reduction in contamination through analytical methods through test strips, turbidity tube, colorimetric kit, microbial test kit. (2 hours)

Step 5 - Students should interpret the results and submit as record. (30 mins)

Experiential-Learning 16.4 : Exploring Collagen in the Cosmetic Industry.

Total Hours : 6 Hours

Activity - 1 (Industry Visit /Field Learning) (Total 2 hours)

Step 1 - Students should understand how collagen is utilized in the cosmetic industry.

Step 2 - Students should visit a local cosmetic manufacturing unit or industry where collagen is used in product formulations (e.g., skin care, anti-aging creams, etc.).

Step 3 - Students should observe sourcing, processing, application of collagen in cosmetics and make a note of it.

Activity 2 - Practical Application and Industry Insights (Total 2 hours)

Step 1 - Students should study plant-based collagen by enrolling in related online courses or webinars.

Step 2 - Collaborate with industry professionals or researchers, if possible.

Step 3 - Analyze and apply theoretical knowledge to real-world extraction techniques.

Step 4 - Students should develop a foundational understanding of sustainable collagen extraction.

Activity 3 - Business Development Plan (Total 2 hours)

Step 1 - Students should understand how to bring a collagen-based cosmetic product to market.

Step 2 - Students should research market trends and target demographics, then create a product development plan covering formulation, packaging, and branding.

Step 3 - Students should create a mini business proposal or pitch for a plant-based collagen cosmetic product.

Experiential-Learning 16.5 : Exploration of Plant tissue culture principles, methods and applications.

Total Hours - 4 Hours

Step 1 - Students should visit and actively participate in the Plant Biotechnology Laboratory.

Step 2 - Students should understand the principles and tools used in the tissue culture method. (45 mins)

Step 3 - Students should explore and analyze various media formulations used in tissue culture. (45 mins)

Step 4 - Students should observe and learn the processes of: (1 1/2 hours)

1. Callus induction

2. Organogenesis

3. Somatic embryogenesis

4. Micropropagation (clonal propagation)

5. Cryopreservation

Step 5 - Students should discuss the applications of plant tissue culture. (30 mins)

Step 6 - Students should observe and document the process and experiences throughout the sessions. (30 mins)

Modular Assessment

Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks. 1. Direct observation of Practical Skills (15 marks) i). Create Mooligai based nano-particles - 5 marks ii). Prepare herbal hair dye from various plants - 5 marks iii). Prepare adhesive gels from Vegan collagens - 5 marks 2. Assignment (10 marks) Visit to Medical Aid manufacturing companies to know safe Bio-applications and submit as a record - 10 marks 3. Mini Project (25 marks) Visit State licence authority and pharmacovigilance department to collect misleading advertisements - 25 marks or Any practical in converted form can be taken for assessment. (25 marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 marks)	4

Paper No : 3 Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin						
Semester No : 3						
Module 17 : Essentials of inorganic chemistry and analytical chemistry						
Module Learning Objectives (At the end of the module, the students should be able to) Describe classification of elements, chemical bonding and chemical reactions. Conduct chemical analysis of siddha raw drugs of metals/mineral origin to elucidate the presence of anions and cations. Apply the Knowledge of chemistry in Rasavadham Siddha alchemy.						
M 17 Unit 1 Essentials of inorganic chemistry and Basics of Siddha Alchemy 17.1.1. Inorganic chemistry 17.1.2. Basics of Siddha alchemy References: 5,39,42,203						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe inorganic chemistry, importance of inorganic chemistry in siddha system, Basic physical quantity and units	2	Lecture	CC	Knows-how	L
CO4	Describe grouping of elements, Periodic law, and relationships in periodic table	1	Lecture	CAN	Knows-how	L&PPT
CO4	Describe about the chemical bonding, cause of chemical reaction, oxidation and reduction reactions, acidity and basicity states of matter,	2	Lecture	CAN	Knows-how	DIS

CO4	Describe the knowledge of inorganic chemistry in Siddha alchemy (<i>Rasavadham</i>)	1	Lecture	CAN	Knows-how	DIS
M 17 Unit 2 Fundamentals of Analytical chemistry 17.2.1. Principles of analytical chemistry 17.2.2. Traceability of analytical chemistry 17.2.3. Quantitative and qualitative of analytical processes 17.2.4. Nuclear Magnetic Resonance(NMR) Spectroscopy 17.2.5. Fourier Transform Nuclear Magnetic Resonance (FTNMR) 17.2.6. Glow Emission spectroscopy 17.2.7. Laser Induced breakdown spectroscopy 17.2.8. Atomic fluorescence spectroscopy References: 128,181,241						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe principles of analytical chemistry, traceability in analytical chemistry, quantitative and qualitative techniques of analytical processes	1	Lecture	CC	Knows-how	L_VC
CO4	Describe about NMR spectroscopy, FTNMR, Glow Emission spectroscopy, Laser Induced breakdown spectroscopy, Atomic fluorescence spectroscopy	3	Lecture	CAN	Knows-how	L_VC
CO4	Perform Pharmacopoeial Identification Test for following Compounds: 1. Miruthar Singi 2. Vediuppu 3. Padikaaram 4. Venkaaram 5. Appalakaram	8	Practical Training 17.1	PSY-GUD	Shows-how	D

	6. Indhuppu or Kalluppu					
CO4	Perform Pharmacopoeial Identification test for Following Compounds. i. Veeram ii. Pooram iii. Lingam iv. Gandhagam	8	Practical Training 17.2	PSY-GUD	Shows-how	
CO4	Perform Following Pharmacopoeial Identification Tests as per Indian Pharmacopoeia. 1. Navachaaram (Ammonium Chloride) 2. Anjanakkal (Antimony Sulphide) 3. Annabedi (Ferrous sulphate) 4. Kaadikkaaram (Silver nitrate)	4	Practical Training 17.3	PSY-GUD	Shows-how	D

M 17 Unit 3 Analytical instrumentation for evaluation of metal and mineral drugs

- 17.3.1. Atomic Absorption Spectroscopy (AAS)
- 17.3.2. Ultra Violet (UV) spectroscopy
- 17.3.3. Infra Red (IR) spectroscopy
- 17.3.4. Raman spectroscopy, Mass spectroscopy
- 17.3.5. Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-OES)
- 17.3.6. X Ray Diffraction (XRD)
- 17.3.7. Energy Dispersive X-Ray Analysis (EDAX)
- 17.3.8. Dynamic Light Scattering (DLS)
- 17.3.9. Scanning Electron Microscopy (SEM)
- 17.3.10. Transmission Electron Microscopy (TEM)
- 17.3.11. X Ray Fluorescence (XRF)

References: 156,192

3A	3B	3C	3D	3E	3F	3G
CO4	Perform drug analysis using following instrumentation AAS,UV spectroscopy, IR spectroscopy ,Raman spectroscopy, Mass spectroscopy	10	Experiential-Learning 17.1	CC	Does	DA,FV
CO4	Perform drug analysis using following instrumentation ICP-OES, XRD,EDAX,DLS	8	Experiential-Learning 17.2	PSY-ADT	Does	FV,DL,DA
CO4	Perform Procedure for drug analysis using following instrumentation SEM, TEM, XRF	7	Experiential-Learning 17.3	PSY-ADT	Does	FV,DA
CO8	Hands on Training on Instrumental Analytical Techniques for Metal and Mineral drugs	1	Experiential-Learning 17.4	AFT-VAL	Does	PER,FV

Practical Training Activity

Practical Training 17.1 : Pharmacopoeial Identification Tests

Total learning hour: 8

Activity 1: Practical(Demonstration) - 1 hour 30 minutes

The teacher clearly describes the objectives of the practical session, such as Identification of raw drugs, substitute of the raw drugs, Purification methods, , Dissolution, and preliminary test, advanced confirmatory test, and importance of Pharmacopoeial Identification Tests.

Activity 2: Group Formation & Sample preparation – 30 minutes

Students shall be grouped into two

Purified raw drugs are taken, powdered using a stone mortar, and dissolved in suitable solvents as prescribed by the Indian Pharmacopoeia.

Activity 3 - Conduct the Experiment: 4 hours 30 minutes of allocation of each group.(Each group select any three raw drugs

Mirutharsingi - Test for Lead compound as mentioned in Indian pharmacopeia

Vediuppu - Test for Potassium nitrate as mentioned in Indian pharmacopeia

Padikaram - Test for Allum compound as mentioned in Indian pharmacopeia

Venkaram -Test for Boric compound as mentioned in Indian pharmacopeia

Applakaram - Test for sodium bicarbonates as mentioned in Indian pharmacopeia

Indhuupu - Test for sodium as mentioned in Indian pharmacopeia

Activity 4: Students will be asked to Demonstrate the Procedure- 30 minutes.

Small group discussions will be conducted based on that, and further discussion will be on various samples could be used for these tests. -30 minutes.

Activity 5: Personalised feedback will be collected. - 10 minutes.

Activity 6:Record the data and document it in record notebook. - 20 minutes.

Practical Training 17.2 : Pharmacopoeial Identification Tests

Total learning hour: 8

Activity 1: 1 hour

The teacher clearly describes the objectives of the practical session, such as Identification of raw drugs, substitute of the raw drugs, , Dissolution, and preliminary test, advanced confirmatory test, and importance of Pharmacopoeial Identification Tests.

Activity 2: Group Formation & Sample preparation - 1 hour

Students shall be grouped into two

Purified raw drugs are taken, powdered using a stone mortar, and dissolved in suitable solvents as prescribed by the Indian Pharmacopoeia.

Activity 3 - Conduct the Experiment: 4 hours of allocation of each group.1hour for each raw drug.

Veeram - Test for Mercury compound as Mentioned in Indian pharmacopeia

Pooram – Test for Mercury compound as Mentioned in Indian pharmacopeia

Lingam - Test for Mercury compound as Mentioned in Indian pharmacopeia

Gandhagam -Test for sulphur in organic compound as mentioned in Indian pharmacopeia

Activity 4: Students will be asked to Demonstrate the Procedure- 30 minutes.

Small group discussions will be conducted based on that, and further discussion will be on various samples could be used for these tests. -30 minutes.

Activity 5: Personalised feedback will be collected. - 20 minutes.

Activity 6:Record the data and document it in record notebook. - 40 minutes.

Practical Training 17.3 : Pharmacopoeial Identification Tests

Total learning hour: 4 hours

Activity 1: (Demonstration) The teacher clearly describes the objectives of the practical session, such as Identification of raw drugs, substitute of the raw drugs, purification techniques, Dissolution, and preliminary test, advanced confirmatory test, and importance of Pharmacopoeial Identification - 30 minutes

Activity 2: Group Formation & Sample preparation - 30 minutes

Purified raw drugs are taken, powdered using a stone mortar, and dissolved in suitable solvents as prescribed by the Indian Pharmacopoeia.

Activity 3 - Conduct the Experiment: 2 hours allocation for Each group, Each group select any two raw drugs

, Each group select

Navachaaram (Ammonium Chloride) - Test for Ammonium chloride as mentioned in Indian pharmacopeia

Anjanakkal (Antimony Sulphide) – Test for Antimony sulphide as mentioned in Indian pharmacopeia

Annabedi (Ferrous sulphate) Test for ferrous salt and sulphate compounds as mentioned in Indian pharmacopeia

Kaadikkaaram (Silver nitrate) -Test for silver compound and nitrate compound

as mentioned in Indian pharmacopeia

Activity 4: Students will be asked to Demonstrate the Procedure- 15 minutes.

Small group discussions will be conducted based on that, and further discussion will be on various samples could be used for these tests. -15 minutes.

Activity 5: Personalised feedback will be collected. - 10 minutes.

Activity 6: Record the data and document it in record notebook. - 20 minutes.

Experiential learning Activity

Experiential-Learning 17.1 : Hands on Training Instrumental Analytical Techniques for Metal and Mineral Drugs

Total learning hours -10

Activity 1: Field Visit - 30 minutes

Overview of Metal and Mineral drugs will be given along with the importance of instrumental analysis and safety protocols and laboratory practices.- 30 minutes

Students will be organized into small groups – 2 to 5 members. They will be asked to visit any Government / AYUSH approved Private Drug Testing Laboratory.

Activity 2: Drug Analysis -9 hrs 30 minutes

Step 1: They'll observe the basics of analytical techniques employed in analysis of Metal and Mineral drugs such as sample preparation and injection. - 3 hours

Step 2: Hands on training on drug analysis using Following Analytical Instrumentations - AAS, UV Spectroscopy, IR Spectroscopy, Raman Spectroscopy, Mass Spectroscopy-5 hours

Step 3: Discussion based on analytical techniques between Faculties and Students. -30 minutes

Step 4 :Student will be asked to submit the detailed report on acquired skills during Hands on Training – 1 hour

Experiential-Learning 17.2 : Hands on Training on Instrumental Analytical Techniques for Metal and Mineral Drugs

Total Learning Hours - 8

Activity 1: Field visit & Demonstration Lab - 3 hours

Group of 10 Students Shall Have to Visit any Government /AYUSH approved Private Drug Testing Laboratory.

Overview of Metal and Mineral drugs will be given along with the importance of instrumental analysis and safety protocols and laboratory practices.

Students shall observe the basics of analytical techniques employed in analysis of Metal and Mineral drugs such as sample preparation and injection. (Any one of drug)

Activity 2: Drug Analysis - 4 Hour

Students shall get Hands on training on drug analysis using Following Analytical Instrumentations -ICP-OES,XRD,EDAX,DLS

Group Presentations/ discussion - 30 minutes

Each group will prepare a presentation summarizing their visit observations and their hands-on experimental results.

The presentations should include:

A description of the analytical techniques used.

An analysis of the data obtained.

Conclusions about the drug samples analyzed.

Discussion of the practical applications of the instruments.

Report - 30 minutes

Students will write individual or group reports detailing their experience and findings.

Experiential-Learning 17.3 : Hands on Training on Instrumental Analytical Techniques for Metal and Mineral drugs

Total Learning hour – 7(Practical)

Activity - 1 (Field visit) Total - 2 hours and 30 minutes

Overview of Metal and Mineral drugs will be given along with the importance of instrumental analysis and safety protocols and laboratory practices. - 30 minutes

Group of 10 Students shall have to visit any Government /AYUSH approved Private Drug Testing Laboratories.

Students shall observe the basics of analytical techniques employed in analysis of Metal and Mineral drugs such as sample preparation and injection. - 2 hours

Activity - 2 (Drug analysis) 4 hours 30 minutes

Students shall get Hands on training on drug analysis using Following Analytical Instrumentations - SEM, TEM, XRF,

Student will be asked to submit the detailed report on acquired skills during Hands on Training

Experiential-Learning 17.4 : Hands on Training on Instrumental Analytical Techniques for Metal and Mineral drugs

Total learning hour- 1 hour

Activity 1 - Field visit(Pre field visit preparation) - 1 hour

Give a brief explanation of the field visit's objectives, which include observing actual geology, identifying common metals and minerals, and comprehending the availability of their formation.

Activity 2: Presentation

Safety Precautions

Fundamental Methods of Identification and Observation

Color, Luster Hardness, Streak, and Crystal Habit/Form

Cleavage/Fracture, Magnetism:

Gathering and Recording

Visual Recognition, Gentle Extraction, Field Testing, Sample Selection, Packaging, and Labeling: Date of collection, Location, Initial observations and tentative identification, Name of the collector)

Field Notes: Students are required to document their observations, drawings, and specifics regarding their notebooks.

Modular Assessment

Assessment method

Hour

Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks . Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C

Choose any of the below assessment for 50 marks

1.Objectives structured Practical examination-25 Marks

- Each Student shall have to do chemical test of any one mineral drug for anions and cations
- Test for Pharmacopial identification(*Navatcharam, Anjanakal, Annabedih, Kadikaram, Veeram, Pooram, Lingam*) -10 marks
- Test for Pharmacopial identification(*Gandhagam, Mirutharsingi, Vediuppu, Padikkaram, Venkaram, Applakaram, Indhuppu*) - 10 marks
- Onsite viva-voce – 5 marks

2. Theory Exam - 25 Marks

- Essay writing
- Modified Essay Questions (MEQ) 4 questions each question carries 5 marks Totally 20 marks
- Theory viva-voce – 5 marks

Or

Any practical in converted form can be taken for assessment.(25 Marks)

and

Any of the experiential can be taken as an assessment.(25 Marks)

4

Module 18 : Medical Mineralogy and Geology

Module Learning Objectives

(At the end of the module, the students should be able to)

Classify the minerals and describe its properties.

Conduct physical examination and chemical analysis of siddha raw drugs of metals/mineral origin to authenticate.

Apply the Knowledge of mineralogy and geology in raw drugs collection and processing.

M 18 Unit 1 Mineralogy, Crystallography, Geology

18.1.1. Classification of minerals

18.1.2. Physical characters of minerals

18.1.3. Thermal characters of minerals

18.1.4. Descriptive mineralogy

18.1.5. Role of trace element and minerals in health and longevity

References: 38,58,144

3A	3B	3C	3D	3E	3F	3G
CO2,CO6,CO7	Describe Mineralogy, Crystallography, Geology	2	Lecture	CC	Knows-how	L&GD
CO2,CO6,CO7	Describe physical characters of minerals, general, organoleptic character, optical characters	2	Lecture	CC	Knows-how	L&GD,L_V C
CO2,CO6,CO7	Describe Thermal Properties, Electric and Magnetic characters of minerals	2	Lecture	CAN	Knows-how	L&PPT ,L,L&GD
CO2,CO6,CO7	Describe descriptive mineralogy of Sulphides, Sulphates, and Sulpho salts, Chlorides, Carbonates, Oxides, Silicates, Nitrates and borates	2	Lecture	CAN	Knows-how	TBL,L_V C,L&PPT ,SDL,PrB L

CO2,CO6,CO7	Describe role of trace element and minerals in health and longevity	2	Lecture	CAP	Knows-how	SDL,DIS, RLE
M 18 Unit 2 Examination of Metals / Minerals - Physical and Chemical 18.2.1. Metals / Minerals Examination using physical characters 18.2.2. Chemical examination of metals / minerals 18.2.3. Collection of Metal/ Mineral ore and examination of collected ore 18.2.4. Analysis of drugs of metals and mineral origin and comparative study of AYUSH drugs References: 38,58,144						
3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7	Perform examination of collected ore of Metal and Mineral origin based on physical characters (Siddha and Modern) and prepare the detailed Authentication report	10	Practical Training 18.1	PSY-GUD	Shows-how	
CO1,CO2,CO6,CO7	Perform Chemical Analysis Ores of Metal and Mineral origin and prepare the detailed Authentication report	10	Practical Training 18.2	PSY-GUD	Shows-how	DA
CO1,CO2,CO6,CO7	Perform Collection of Metal/ Mineral ore and examination of collected ore	10	Experiential-Learning 18.1	PSY-GUD	Does	FV
CO1,CO2,CO6,CO7	Perform Physical Examination of collected Metal or Mineral ore	6	Experiential-Learning 18.2	AFT-CHR	Does	DL,DA
CO1,CO2,CO6,CO7	Perform Chemical analysis of Collected ore and prepare a detailed authentication report	10	Experiential-Learning 18.3	PSY-ADT	Does	DA,D
Practical Training Activity						
Practical Training 18.1 : Examination of Minerals / Metal ore - Physical						

Total learning hour: 10

Activity 1 - The teacher clearly establishes the objectives of the practical session, such as Identification of collected / given ore ,purification techniques Physical properties of drugs, Safety precautions performing assessments and exploring management strategies - 1 Hour

Activity 2 - Group Formation 15 minutes

Students shall be grouped into two or three (Minimum 2, Maximum 4)

Required items for the practical should be issued to the students.

Activity 3 - Conduct the Experiment: 8 hours each metals allotted for 2 hours

Four Metal/Mineral ores shall be allocated to the each Student.

Tests for Physical examinations:

- a. Sample Handling
- b. Visual inspection (Colour, luster, crystal forms)
- c. Hardness
- d. Cleavage & fracture
- e. Streak test
- f. Specific gravity
- g. Density(optional)
- h. Magnetism
- i. Other properties(Taste, Odor, Feel, tenacity, Transparency/diaphaneity)

Activity 4 - Small group discussions will be conducted based on that, and summarize the key characteristics of each sample and compare your observation with known mineral identifications charts – 5 minutes

Activity 5 - Record the data - 10 minutes

- a. Include the sample name or number
- b. Record the all physical properties(colour, lustre etc.,)

Activity 6 - Evaluation & report: based on the observed physical properties to identify the metals or mineral present in the given ore sample using reference materials(Textbooks, Mineral identification guides) – 10 minutes

Activity 7 - Record the data and document it in record notebook. - 20 minutes.

Practical Training 18.2 : Chemical Analysis of Metal and Mineral Ore

Total Learning hour -10

Activity 1: Teacher Should clearly explain about the methods of chemical examination *metal and mineral ore*.- 1 hour

Activity 2: Each student should be provided with sample of *Metal / Mineral ore*. Practicals should be done individually - 30 minutes

Activity 3: Student should perform following Analysis on provided sample.- 6 hours 30 minutes

General Tests:

1. Open and Closed tube hearing
2. Charcoal Heating test
3. Borax Bead test
4. Blow pipe Test

Specific tests:

Specific tests for the mineral

E.g – If the provided sample is ammonium chloride tests for presence of ammonia and tests for chloride should be performed

Activity 4 : After The analysis student should prepare a detailed Drug Authentication Report Based on the conducted Analysis with rationale of the conclusion.- 1 hour

Activity 5 : Post Activity Discussion - 1 hour

Experiential learning Activity

Experiential-Learning 18.1 : Metal and Mineral Ore Collection

Total Learning hour - 10

Activity 1: Faculty will give a brief overview about the Metal and Mineral ores, their nature, geological formations and mineral deposits, physical and chemical properties, purification process, medicinal properties, and about their usage prior to the field visit 30 minutes

Activity 2: Field visit and observation - 8 hours

1. Students will be organized into small groups – 2 to 5 members and will visit Various places/Mineral mines for collection of Metal and Mineral ore.
2. Safety guidelines for field collection will be given.
3. They will be asked to collect 3 different ores.
4. Experts from the field of Minerology will guide the students to ascribe skills in methods of ore collection.

Activity 3: Each student will be asked to collect the ore individually at adequate quantity required for examination and analysis.

Chemical analysis for respective ore collected should be done.

Activity 4: Discussion based on Metallic & Mineral ore collection between Faculties and Students. - 30 hour

Activity 5: Student will be asked to submit the detailed report on acquired skills during observation Training – 1 hour

Experiential-Learning 18.2 : Physical Examination of Collected Metal/Mineral ore

Total Learning hour - 6 hour

Activity 1 Lecture:

Teacher Should clearly explain about the collected mineral and methods of physical examination - 30 minutes

Activity 2: Demonstration in Lab

Each student should be provided with sample of collected ore. Examination should be done individually

Activity 3: drug Analysis

Student should perform following examination on Collected ore -3 hour 30 minutes

Colour, Taste, Odour, Lustre, Opacity, Hardness, Cleavage, Tenacity, Elasticity, Specific Gravity/ relative density, Refraction etc.

Activity 4: Lab report interpretation

After The examination Student should prepare a detailed Drug Authentication Report Based on the conducted examination with rationale of the conclusion.

Activity 5

Small group discussion & Submit the detail report - 1 hour

Activity 6:

Presentation - 1 hour

Experiential-Learning 18.3 : Chemical Analysis of Collected ores

Total Learning hours- 10

Activity 1 - Teacher Should clearly explain about the collected mineral and methods of Chemical analysis - 1 hour

Activity 2 - Demonstration

Each student should be provided with sample of collected ore. Examination should be done individually

Activity 3 - Drug analysis

Student should perform following analysis on Collected ore - 8 hour

General Tests:

Open and Closed tube hearing

Charcoal Heating test

Borax Bead test

Blow pipe Test

Specific tests:

Specific tests for the mineral ore collected should be done

E.g – If the collected ore is copper sulphate tests for presence of copper and tests for sulphate groups should be performed

Activity 4 - After The analysis student should prepare a detailed Drug Authentication Report Based on the conducted Analysis with rationale of the conclusion.

Activity 5 - Post Activity Discussion - 30 minutes

Activity 6 - Presentation skills- 30 minutes

Modular Assessment

Assessment method

Hour

Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks

1. Objectives structured Practical examination - 25 marks

- Physical examination of metals and mineral drugs 10 marks
- Chemical examination of metals and mineral drugs 10 marks
- Preparation of authentication report – 5 marks

2. Theory - 25 marks

Multiple choice questions - 10 Marks

- Total of 20 Questions
- Each question carries 0.5 Marks

Short answer questions - 15 Marks

- Total of 3 Questions
- Each question carries 5 marks

Or

Any practical in converted form can be taken for assessment.(25 Marks)

and

Any of the experiential can be taken as an assessment.(25 Marks)

4

Semester No : 4

Module 19 : Safety Pharmacology of Metals and Mineral Drugs

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe carcinogenicity, Mutagenicity, Genotoxicity and Immunotoxicity, eco toxicity of Certain metals
Conduct clinical safety pharmacological studies in order to elucidate the toxicity of medications of metals and mineral drug
Apply the Knowledge of safety pharmacology in prevention of toxicity

M 19 Unit 1 Molecular mechanism of metal toxicity, carcinogenicity

19.1.1. Molecular mechanism of selected metal toxicity and carcinogenicity 19.1.1.1. Iron
19.1.1.2. Zinc
19.1.1.3. Arsenic
19.1.1.4. Lead
19.1.1.5. Cadmium
19.1.1.6. Copper
19.1.1.7. Mercury 19.1.2. Impacts of metal on signal transduction pathway and gene expression

References: 108,265

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO4 ,CO6	Describe Molecular mechanism of selected metal toxicity and carcinogenicity Iron, Zinc, Arsenic, Lead, Cadmium, Copper, Mercury	2	Lecture	CAP	Knows- how	L&PPT ,L_VC,LS
CO1,CO2,CO4 ,CO6	Describe impacts of metal on signal transduction pathway and gene expression	2	Lecture	CAP	Knows- how	TPW,DIS ,PrBL

M 19 Unit 2 Mutagenicity, Genotoxicity, Ecotoxicity and Metal interaction

- 19.2.1. Mutagenic and genotoxic effects of metals
- 19.2.2. Eco toxicity, immunotoxicity of metals
- 19.2.3. Influence of age, Sex other factors on metal toxicity
- 19.2.4. Influence Alcohol and tobacco on metal mechanism
- 19.2.5. Metal- Metal interaction, carcinogenic and non-carcinogenic effects
- 19.2.6. Arsenic, Iron, Lead, Zinc, Mercury, Copper, Potassium, and other metals
- 19.2.7. Centre for cellular and molecular biology, Institute of Toxicology Research

References: 148

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO4,CO6	Describe mutagenic and genotoxic effects of metals	1	Lecture	CAN	Knows-how	L&GD,L
CO1,CO2,CO4,CO6	Describe about Eco toxicity, immunotoxicity of metals	1	Lecture	CAN	Knows-how	L,L_VC, L&PPT, L&GD
CO1,CO2,CO4,CO6	Describe Influence of age, Sex other factor on metal toxicity	1	Lecture	CAP	Knows-how	PBL,CBL,PSM
CO1,CO2,CO4,CO6	Describe and Interpret Influence of drugs Alcohol and tobacco on metal toxicity	1	Lecture	CAP	Knows-how	PSM,PBL
CO1,CO2,CO4,CO6	Describe Metal- Metal interaction carcinogenic and non-carcinogenic effects of following metals Arsenic, Iron, Lead, Zinc, Mercury, Copper, Potassium, and other metals	2	Lecture	AFT-RES	Knows-how	L&GD,DIS
CO1,CO2,CO4,CO6,CO8	Visit to centre labs for cellular and molecular biology, Institute of Toxicology Research	10	Experiential-Learning 19.1	AFT-SET	Does	DIS,FV

M 19 Unit 3 Assessment of Safety Pharmacology of metal and mineral

19.3.1. Limit tests for presence of heavy metals in the given sample

19.3.2. Pharmacovigilance practice in drugs of metal and mineral origin Assessment and reporting of clinical safety pharmacology (Adverse Drug Reactions (ADR) reporting /case series)

19.3.3. Renal toxicity, liver toxicity using Liver Function Test (LFT) and Renal Function Test (RFT)

References: 101,120,246

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO4,CO6	Perform Limit tests for presence of heavy metals in the given sample	8	Practical Training 19.1	PSY-GUD	Shows-how	DL
CO1,CO2,CO4,CO6	Perform Limit tests for presence of heavy metals in the given sample	8	Practical Training 19.2	PSY-GUD	Shows-how	DL,DA
CO1,CO2,CO4,CO6	Perform Limit tests for presence of heavy metals in the given sample Arsenic, Mercury, Lead, Cadmium	4	Practical Training 19.3	PSY-GUD	Shows-how	DA,DL
CO1,CO2,CO4,CO6,CO8	Document ADRs and Pharmacovigilance Practice in Medications of Metal and Mineral Origin	8	Experiential-Learning 19.2	AFT-SET	Does	CBL,CD
CO1,CO2,CO4,CO6,CO8	Perform Assessment and reporting of clinical safety pharmacology (case report /case series) Renal toxicity, liver toxicity using LFT and RFT	8	Experiential-Learning 19.3	AFT-CHR	Does	LRI,CBL,CD

Practical Training Activity

Practical Training 19.1 : Limit Tests for Presence of Heavy Metals in *Parpam*

Total learning hour: 8

Activity 1- practical(Demonstration in Lab) - 30 minutes

The teacher tells the practical session objectives for, for example: Heavy metals analysis - Importance of limit test, Sample preparation, Standard solutions preparations, test solution preparation, colour changes, and performing assessments - 30 minutes

Group Formation & sample preparation – 1 hour

Students to be grouped into one or two (Minimum 2 maximum-5)

Activity 2- Practical 6 Hours

Conduct the Experiment:

Step 1 :Required items for the practical's shall be issued to the students.

Each student shall be allocated with any two Parpam.Here shall be 3 hours of time allocation for each sample.

Step 2 : Students Shall have to perform Limit tests in sample for the presence of Heavy Metals such as Arsenic, Mercury, Lead, Cadmium

Step 3 :Small group discussions will be conducted based on that, and further discussion will be on other substance in parpam interfere with the colour development -10 minutes.

Step 4 :Personalised feedback will be collected. – 20 minutes.

Practical Training 19.2 : Limit Tests for Presence of Heavy Metals in *Chendooram*

Total learning hour: 8

Activity 1 - Demonstration in lab - 1 hour

The teacher clearly describes the objectives of the practical session, such as of Heavy metals analysis, Importance of limit test, Sample preparation, Standard solutions preparations, and test solution preparation, and colour changes, performing assessments

Group Formation & sample preparation

a. Students shall be grouped into one or two (Minimum 2 maximum-4)

Required items for the practical's shall be issued to the students.

Activity 2: Drug Analysis 6 hours

Step 1 :Conduct the Experiment:

Each student shall be allocated with any two *Chendooram*.

There shall be 3 hours of time allocation for each sample.

Students Shall have to perform Limit tests in sample for the presence of Heavy Metals such as

a. Arsenic

b. Mercury

c. Lead

d. Cadmium

Step 2 : Small group discussions will be conducted based on that test (E.g. Other substance in chendooram may interfere with the colour development) -20 minutes.

Step 3 : Personalised feedback will be collected -20 minutes.

Step 4: Record the data and document it and submit detailed report. - 20 minutes.

Practical Training 19.3 : Limit tests for presence of heavy metals in *Chunnam*

Total Learning Hours: 4

Activity 1 Practical(Demonstration in lab) 1 hour 25 minutes

The teacher clearly describes the objectives of the practical session, such as of Heavy metals analysis, Importance of limit test, Sample preparation, Standard solutions preparations, and test solution preparation, and colour changes, performing assessments, and exploring management strategies

Group Formation & sample preparation

a. Students shall be grouped into one or two (Minimum 2 maximum-5)

Required items for the practical's shall be issued to the students.

Activity 2 - Drug Analysis 2 hours

Conduct the Experiment:

Step 1 -Each student shall be allocated with any one *Chunnam*

Students Shall have to perform Limit tests in sample for the presence of Heavy Metals such as Arsenic, Mercury, Lead, Cadmium

Step 2 - Small group discussions will be conducted based on that, and further discussion will be on various samples could be used for these tests. -10 minutes.

Step 3- Personalised feedback will be collected. – 15 minutes.

Step 4- Record the data and document it and submit the detail report - 10 minutes.

Experiential learning Activity

Experiential-Learning 19.1 : Centres for Cellular and Molecular Biology, Institutes of Toxicological research

Total learning hour-10

Activity 1: Field visit 8 hours 30 minutes

Brief overview on Cellular and Molecular Biology will be given priorly.- 30 minutes

Students will be organized into small groups – 2 to 5 members for the field visit.

They should Observe the Methods used in Evaluation of Mutagenicity, Carcinogenicity, and Genotoxicity such as DNA extraction, how PCR is performed etc...

They will be encouraged to interact with researchers or professionals.

Activity 2: Discussion 1 hour 30 minutes

Students will be asked to submit an assignment based on their experience. This can include,

- Summarizing the key findings

- Analyzing the collected Data
- Reflecting on the relevance of the visit

Experiential-Learning 19.2 : Pharmacovigilance Practices

Total learning hour - 8

Activity 1: Case Diagnosis - 1 hour

Students should be given adequate information on Pharmacovigilance

Practices (Adverse Drug Reaction) priorly.

Activity 2: Case Based Learning - Total 7 hours

They are asked to visit any of AYUSH IPVC/PPVC Centers.

They may Visit Pharmacovigilance Unit of their OPD if the IPVC or PPVC is attached to the teaching hospital - 3 hours

step 1: They will be asked to inquire about ADR reported cases.

Expertise in ADR reporting, Risk Assessment, signaling etc. will be encouraged among the students.-1 hour

Step 2: If the cases are found, students will be asked to make a detailed report on the history of the patients, and the medications taken by them, and due to which the ADR produced. – 2 hours

Step 3: They will be asked to record the collected data and the same should be documented in their report. 30 minutes

Step 4: Student can be assessed for acquired skills by simulated case-based learning.- 30 minutes

Experiential-Learning 19.3 : Safety Assessment of Siddha Medications of Metal and Mineral Origin.

Total learning hour- 8

Activity 1: Case based Learning - 4 hours

Students should be given adequate information on safety Assessment of *siddha* medication of metal and mineral drugs.

Each Student should have to visit OPD of the Teaching hospital

Activity 2: Case Diagnosis - 4 hours

They will be asked to observe Minimum of Five patients who are under Medications of Metals and Minerals for any toxic effects, using investigational tools such as LFT and RFT for Hepatotoxicity and Renal toxicity

Based on their observation, they will be asked to prepare a detailed case report and publish it as case report or case series.

Modular Assessment

Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks . Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks 1. Objectives structured Practical examination – 20 Marks Perform Limit test for any two Raw drugs of metals and mineral origin Test for each drug carries Ten Marks 2. Quiz – 20 Marks Student shall be divided into 2 groups Each group shall be assigned with group code Each group shall be asked with questions and the score was recorded based on the answers The structure of quiz shall be as follows Rapid Fire Questions Questions with Multiple Choices Visual and Audio based Questions. 10 Questions from Molecular mechanism of metal toxicity and carcinogenicity 10 Questions from Mutagenicity, Ecotoxicity, Genotoxicity and metal interaction 3.Theory essay writing – 10 Marks Student shall have to write essay on pharmacovigilance practice of metals and minerals based drugs. Or Any practical in converted form can be taken for assessment.(25 Marks) and Any of the experiential can be taken as an assessment.(25 Marks)	4
Module 20 : Recent advances including applied pharmaceutics	
Module Learning Objectives (At the end of the module, the students should be able to) Describe about Various Dosage forms and drug Delivery Systems	

Conduct Standardization of Siddha Drugs
 Apply the Knowledge of recent advances in Metallo-therapeutics Clinically.

M 20 Unit 1 Dosage forms, Delivery system and delivery route including Novel drug delivery system

20.1.1 Various dosage forms and delivery system

20.1.2 Various routes of drug administration and its significance in Siddha System of Medicine

References: 7,122

3A	3B	3C	3D	3E	3F	3G
CO5,CO6,CO7 ,CO8	Describe various dosage forms, delivery systems and various routes of drug administration and its significance in Siddha system of medicine	1	Lecture	CAP	Knows-how	L,L&GD, L&PPT

M 20 Unit 2 Drug Standardization, Drug Discovery and development

20.2.1 Process of drug discovery and development

20.2.2 Developing newer formulations of metals, minerals based on

20.2.3 Genetic aspects of drug discovery and development, Drug

20.2.4 Standardization of metals and mineral drugs - organoleptic analysis

20.2.5 Drug discovery and development process

modern and Siddha techniques

targeting technology

characters, macroscopic and microscopic study, physico

chemical

References: 79,101,209

3A	3B	3C	3D	3E	3F	3G
CO5,CO6,CO7	Discribe the process of drug discovery and development	1	Lecture	CAN	Knows-	L&GD,L

,CO8					how	_VC,L&P PT
CO5,CO6,CO7 ,CO8	Describe newer formulations of metals and minerals based on modern and Siddha techniques	1	Lecture	AFT-RES	Knows-how	TPW,PrBL
CO5,CO6,CO7 ,CO8	Describe Genetic aspects of drug discovery and development	1	Lecture	CC	Knows-how	L&GD,DIS
CO5,CO6,CO7 ,CO8	Describe drug targeting technology	1	Lecture	CC	Knows-how	L_VC,TBL
CO5,CO6,CO7 ,CO8	Perform standardization of drug of metals and mineral origin- organoleptic characters, macroscopic and microscopic study, physico chemical analysis	10	Experiential-Learning 20.1	AFT-VAL	Does	FV,DA,L
CO5,CO6,CO7 ,CO8	Visit any Government / Private Drug Research Institutes and Observe drug Discovery and Development Process.	8	Experiential-Learning 20.2	AFT-VAL	Does	FV

M 20 Unit 3 Current trends in Metallo-therapeutics

20.3.1 Listed elements as Metallo therapeutic agents in following Magnesium , Aluminium, Organo silicon, Calcium

20.3.2 Listed elements as Metallo therapeutic agents in following Manganese, Cobalt, Gallium, Germanium

20.3.3 Listed elements as Metallo therapeutic agents in following Ruthenium, Rodium, Palladium, Rhenium, Platinum

20.3.4 In-Silico Pharmacokinetics and Pharmacodynamics.

aspects Biological role, Targets, Therapeutic aspects - Lithium,

Boron,

aspects Biological role, Targets, Therapeutic aspects - Titanium,

Vanadium,

aspects Biological role, Targets, Therapeutic aspects -

Selenium,

References: 5,41,62,164

3A	3B	3C	3D	3E	3F	3G

CO1,CO2,CO6 ,CO7,CO8	Describe listed elements as Metallo therapeutic agents and its Biological role, Targets, Therapeutic uses. 1.Lithium 2.Boran 3.Magnesium 4.Aluminium 5.Organo silicon 6.Calcium	1	Lecture	CAP	Knows-how	L&GD,L &PPT ,SDL
CO1,CO2,CO6 ,CO7,CO8	Describe listed elements as Metallo therapeutic agents and its Biological role, Targets and Therapeutic uses. 1.Titanium 2.Vanadium 3.Manganese 4.Cobalt 5.Gallium 6.Germanium	1	Lecture	CAP	Knows-how	L,L&PPT ,L&GD
CO1,CO2,CO6 ,CO7,CO8	Describe listed elements as Metallo therapeutic agents in following aspects Biological role, Targets, Therapeutic aspects. 1.Selenium 2.Ruthenium 3.Rodium 4.Palladium 5.Rhenium 6.Platineum	1	Lecture	CAP	Knows-how	L&GD,L &PPT
CO4,CO8	Collect the information and document about in silico studies of Metal and Mineral drugs and organometallic compounds.	4	Experiential-Learning 20.3	AFT-CHR	Does	FV

M 20 Unit 4 Pharmacogenomics and Nano pharmacology and other emerging technologies in pharmacology

20.4.1 Pharmacogenomics and personalised medicine

20.4.2 Nano - technology and Nano materials

20.4.3 Application of Nano metals in pharmacology, Isolation of Nanometals from drugs of animal and Metal origin in Siddha aspects
eg *Poonaga sathu*, Extraction of *sembu* from *Indrakopa poochi*, and *poonagam*

20.4.4 Analysis for presence of Nano metals in Herbal drugs

References: 36,91,121

3A	3B	3C	3D	3E	3F	3G
CO5,CO6,CO7,CO8	Describe Pharmacogenomics and personalised medicine	1	Lecture	CC	Knows-how	L&PPT, L&GD, L
CO5	Describe Nano - technology and Nano materials and its application of Nano metals in pharmacology	1	Lecture	CC	Knows-how	L, L&PPT, L&GD
CO5,CO7	Preparation of extract Sembu Nano Metal Present in <i>Poonagam</i> using Traditional Method	10	Practical Training 20.1	PSY-GUD	Shows-how	D
CO5,CO7	Preparation of extract of Nanometal <i>Sembu</i> present in <i>Indirakoba Poochi</i>	10	Practical Training 20.2	PSY-GUD	Shows-how	D
CO3,CO7	Perform Analysis for presence of Nano metals in Herbal drugs mentioned as <i>Uloga sathulla mooligaigal</i> .	4	Experiential-Learning 20.4	AFT-CHR	Does	DA

Practical Training Activity

Practical Training 20.1 : Extraction of Sembu from *Poonagam*

Total learning hour: 10

Teacher outline

The teacher clearly outlines the objectives of the practical session, such as Identification of *Poonagam*, purification techniques and other purification techniques. they should discuss the overview of extraction methods, performing assessments and exploring management strategies- 1 Hour

Activity 1: Demonstration

Step 1: Group Formation:

Students should be grouped into two (Maximum 3)

Step 2 :Required items for the practical's will be issued to the students.

Each group will be provided with Collected / Procured *Poonagam*

Step 3: Each group should perform extraction of *Sembu* from *Poonagam* using Traditional Methods Mentioned in Gunapaadam Thathu Jeeva Vaguppu.

Activity 2: Practical

Step 1: Sample preparation (2 Hours)

1. Source Preparation:

Collection

Cleaning

Preprocessing

Drying

Grinding or crushing

Homogenization

2. Extraction:

Solvent Extraction

Chemical Extraction

Biological extraction

3. Separation and Purification:

Filtration

Centrifugation

Precipitation

Step 2: Conduct the experiment- 6 hours

Step 3: Group discussions will be conducted based on that, and further discussion will be on various samples could be used for these tests. -20 minutes.

Step 4: Personalised feedback will be collected. - 20 minutes

Step 5: Record the data and document it. Detailed report submitted. - 20 minutes.

Practical Training 20.2 : Extraction of *Sembu* from *Indirakoba Poochi*

Total learning hour: 10

Activity 1: Practical (Demonstration) - 1 hour

The teacher clearly outlines the objectives of the practical session, such as Identification of *Indirakoba poochi*, purification techniques and other purification techniques. they should discuss the overview of extraction methods, performing assessments and exploring management strategies.

Activity 2 : Practical - 6 hours

Step 1: Students should be grouped into two (Maximum 3)

Required items for the practical's will be issued to the students.

Each group will be provided with Collected / Procured *Indirakoba Poochi*.

Step 2: Each group should perform extraction of *Sembu* from *Indirakoba Poochi* using Traditional Methods Mentioned in *Romarishi Vaithiyam 500*.

Sample preparation (2 Hours)

1. Source Preparation:

Collection

Cleaning

Preprocessing

Drying

Grinding or crushing

Homogenization

2. Extraction:

Solvent Extraction

Chemical Extraction

Biological extraction

3. Separation and Purification:

Filtration

Centrifugation

Precipitation

conduct the experiment-

Step 3 : Group discussions will be conducted based on that, and further discussion will be on various samples could be used for these tests. -20 minutes.

Step 4 : Personalised feedback will be collected. - 20 minutes

Step 5 : Record the data and document it. Detailed report submitted. - 20 minutes.

Experiential learning Activity

Experiential-Learning 20.1 : Standardization of Siddha drugs of metals and mineral origin

Total Learning hour -10

Activity 1: Lecture 1 hour

Students should be given adequate information on standardization of Siddha drugs and the importance of Standardization.

Activity 2: - Drug analysis - 2 hours

1. Students will be organized into small groups – 2 to 5 members and will be asked to Visit any Government Research institute.
2. Observe the methods used in standardization of Siddha Metal and Mineral Drugs

Step 2: Individual students shall be asked to Perform Standardization of Drugs in Metals and Mineral origin on following Parameters - 6 hours

- a. Organoleptic Characters
- b. Macroscopic and Microscopic Studies
- c. Physico-Chemical analysis

Step 3 : Group discussion based on the analysis between faculty members and Students.- 1 hour

All students should publish the standardization data in any scientific publication medium

Experiential-Learning 20.2 : Observation of Strategies used in Drug discovery and Development Process.

Total Learning hour -8

Activity 1: Lecture

Student should be given adequate information on Drug discover (Target identification, Lead discovery Lead optimization)Preclinical development(in vitro & in vivo studies, Formulation development, Clinical development(Phase I, II,III, New drug application, Phase IV) – 1 Hour

Activity 2: Field visit - Students will be organized into small groups – 2 to 5 members and will be asked to Visit any Government / Private Drug Research institute. - 5 Hours

Step 2: General field visit protocols will be given.

Step 3: They are asked to observe the methods and Strategies used in process of drug discovery and drug development

Step 4: Key insights and discussion - 1 Hour

Step 5: Conclusion and submit a detailed report of post field visit – 1 hour

Experiential-Learning 20.3 : In-Silico Screening of Drugs of Metal / Mineral / Organometallic origin.

Total Learning hours -4

Activity 1 : A brief overview of In-Silico Screening of Drugs of Metal / Mineral / Organometallic origin should be given to the students priorly. – 1 Hour

Activity 2: Field visit - 2 hours

- Each student should visit the computer lab.
- Computer lab shall equipped with Pre installed Commercially available
- Operating Environments and programs for screening or Shall Use any Open-source Environments.
- Students should be trained with above software with adequate materials.

Step 2: Each student shall be asked to select any one Organometallic / Metal / Mineral Molecule and perform In-Silico studies using above programs. - 1 hour

Step 3: Students should publish the obtained data in any Indexed Journal.

Experiential-Learning 20.4 : Analysis for the Presence of Nanometals in Herbs mentioned as *Uloga sathulla mooligaigal*.

Total learning hour -4

Activity 1: Lecture

A brief overview on the Metal containing Herbs, their identification process, their importance should be given to the students. – 30 minutes

Activity 2: Experiential Learning - Drug Analysis Total 4 hours

Step 1 :Each student will be asked to select any one of the Herbal Drug - 30 minutes

Students shall Prepare the sample as per the sample Preparation Protocol.

Step 2 : Can Submit the sample to any of the Government/ Certified Private Sophisticated Analytical instrument facility - 1 hour

Step 3 : They should acquire the test report and write Research article with obtained data – 2 hours

Step 4 Student should publish the article in any Indexed Journals.

Modular Assessment

Assessment method

Hour

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Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks.

1.Class presentation – 10 Marks

Each student shall have to do presentation on drug targeting technology, Drug discovery and development -10 marks

4

2. Mini Project – 20 Marks

Each student shall do biological role, target and therapeutic aspects of Novel metallo-therapeutic drugs

3. Objective Structured Practical Examination – 20 Marks

Extraction of *Sembu* from *Poonaagam* and *Indirakopa poochi*

Or

Any practical in converted form can be taken for assessment. (25 Marks)

and

Any of the experiential can be taken as an assessment. (25 Marks)

Semester No : 5

Module 21 : Ulogangal and Panchasootham (Metals and Mercurial Compounds)

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe General characteristics, Therapeutic uses, Mechanism of action of metal drugs

Conduct Various purification process and vaippu methods of metal drugs

Apply the Knowledge of Siddha Marunthial in Research to figure out the mechanism of action, ADME of siddha medication.

Describe the Origin Reason for synonyms, Organoleptic characters, Reason for being Natpu sarakku and Pakai sarakku of Mercurial compounds.

Conduct various purification process and vaippu methods of Mercurial compounds.

M 21 Unit 1 Transitional Metals - Ayam - Iron, Sembu- Copper, Nagam - Zinc, Velli - Silver and Thangam - Gold

21.1.1. Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and pagai sarakku (agonist and antagonist), Peculiar characteristics, Varieties, Medicinal uses, Nanju kurigunam (toxic symptoms) and murivu (antidote), Scientific aspects of following metals 21.1.1.1. *Ayam* - Iron

21.1.1.2. *Sembu* - Copper

21.1.1.3. *Nagam* - Zinc

21.1.1.4. *Velli* - Silver

21.1.1.5. *Thangam* - Gold 21.1.2 Various purification methods
 21.1.3 Biological roles
 21.1.4 Extraction method of metals from plants using Traditional Methods
 21.1.5 Formulations prepared from above said metals

References: 138,152,205,234,276,278,279,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3,CO5	Perform various purification methods - <i>Sembu</i>	5	Practical Training 21.1	PSY-GUD	Shows-how	L&GD,D,DL,DG
CO1,CO2,CO3,CO5	Describe the Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and pakai sarakku, Peculiar characteristics, Varieties, scientific aspects of following metals <i>Ayam, Sembu, Nagam, Velli, Thangam</i>	2	Lecture	CAP	Knows-how	L&GD,FV,D,DG,L&PPT
CO1,CO2,CO3,CO5	Describe the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs	1	Lecture	CAP	Shows-how	L&PPT, L&GD,DIS,PrBL,DA

M 21 Unit 2 Post Transitional Metals - Vangam - Lead, Mirutharsingi - Galena sulphide, Velvangam - Tin

21.2.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and pakai sarakku (Agonist and Antagonist), Peculiar characteristic, Medicinal uses, Nanju kurigunam (toxic symptoms) and murivu (antidote), Scientific aspects of following metals 21.2.1.1 Vangam - Lead
 21.2.1.2 Mirutharsingi - Galena sulphide
 21.2.1.3 Velvangam - Tin 21.2.2 Extraction of lead from *Mirutharsingi*
 21.2.3 Various purification methods
 21.2.4 Biological roles
 21.2.5 List out the formulations prepared from above said metals

References: 138,152,205,234,276,278,279,280

3A	3B	3C	3D	3E	3F	3G
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CO1,CO2,CO6,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Reason for being <i>Natpu sarakku</i> and <i>Pagai sarakku</i> , Peculiar characteristics, <i>Nanju kurigunam</i> and <i>murivu</i> , scientific aspects of following metals - Lead, Galena sulphide, Tin	1	Lecture	CAP	Knows-how	DIS,L&GD,DL
CO1,CO2,CO6,CO7,CO8	Perform Extraction of <i>Karuvangam</i> (Lead) from <i>Mirutharsingi</i>	2	Practical Training 21.2	PSY-GUD	Shows-how	L&GD,W,DIS
CO1,CO2,CO6,CO7,CO8	Perform various purification methods – <i>Velli, Naagam</i>	3	Practical Training 21.3	PSY-GUD	Shows-how	DL,L&GD
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1	Lecture	CAP	Knows-how	LS,BL,L&GD

M 21 Unit 3 Miscellaneous Metals - Ekku - Steel, Ayanagam - Iron Zinc Alloy, Mandooram - Iron Oxide, Kaantham - Magnetite

21.3.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *pakai sarakku* (agonist and antagonist), Peculiar characteristic, Varieties, Medicinal uses, *Nanju kurigunam* (Toxic symptoms) and *murivu* (antidote), Scientific aspects of following metal 21.3.1.1 *Ekku* - Steel

21.3.1.2 *Ayanagam* - Iron zinc alloy

21.3.1.3 *Kaantham* - Magnetite

21.3.1.4 *Mandooram* - Iron oxide 21.3.2 Biological roles

21.3.3 Traditional testing method for purified *kaantham*.

21.3.4 Formulations prepared from above said metals

21.3.5 Meta-analysis of recent research

References: 138,152,205,234,276,278,279,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Document Meta-analysis on one topic from research articles and publish minimum of one research article in scientific publication medium	1	Experiential-Learning 21.1	CAP	Does	PER,FV,DIS
CO1,CO2,CO6,CO7,CO8	Perform Meta-analysis of research articles and publish minimum of one research article in scientific publication medium	1	Experiential-Learning 21.	CAP	Does	DIS,L&PPT,PER,

			2			L&GD
CO1,CO2,CO6,CO7,CO8	Discuss the Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and pakai sarakku, Peculiar characteristic, Varieties, scientific aspects of following metal <i>Ekku, Ayanagam, Kaantham, Mandooram</i>	1	Lecture	CAP	Knows-how	D,L&GD, DIS,LS
CO1,CO2,CO6,CO7,CO8	Perform Various Purification Methods of <i>Velvangam</i> and <i>Karuvangam</i>	5	Practical Training 21.4	PSY-GUD	Shows-how	W,L_VC, DL
CO1,CO2,CO6,CO7,CO8	Describe the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1	Lecture	CAP	Knows-how	L&GD
CO1,CO2,CO6,CO7,CO8	Perform traditional testing method for purified <i>Kaantham</i> .	1	Experiential-Learning 21.3	AFT-VAL	Does	L&GD,DIS,DL
CO1,CO2,CO6,CO7,CO8	Document the review on History of <i>Panchasootham</i>	1	Experiential-Learning 21.4	CS	Does	L&PPT,TBL
CO1,CO2,CO6,CO7,CO8	Perform Meta-analysis of research articles on one topic and publish minimum of one research article in scientific publication medium	3	Experiential-Learning 21.5	AFT-CHR	Does	ML,TBL,L_VC,D A

M 21 Unit 4 Panchasootham- Mercury and Mercurial compounds

21.4.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *pagai sarakku* (agonist and antagonist), Peculiar characteristics, Varieties, *Nanju kurigunam* (Toxic symptoms) and *murivu* (antidote), Medicinal uses, Scientific aspects of following 21.4.1.1 *Rasam* - Mercury
21.4.1.2 *Rasa chendooram* - Redsulphide of Mercury
21.4.1.3 *Lingam* - Cinnabar
21.4.1.4 *Pooram* - Mercuric sub chloride
21.4.1.5 *Veeram* - Mercuric per chloride 21.4.2 Vaippu muraikal
21.4.3 Various purification Techniques
21.4.4 Biological roles

21.4.5 Organo mercurial compounds

21.4.6 Formulations

21.4.7 Meta-analysis of recent research

21.4.8 National metallurgic laboratory, Central drug research institute, Geological survey of India, Institute of minerals and material technology

21.4.9 Extraction methods

References: 27,111,116,138,152,205,206,234,276,278,279,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6 ,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and Pakai sarakku, Peculiar characteristic, Varieties, Nanju kurikgunam and murivu, scientific aspects of following <i>Rasam, Rasa chendooram, Lingam, Pooram, Veeram</i>	1	Lecture	CAP	Knows-how	L&GD,L &PPT ,BS,REC
CO1,CO2,CO6 ,CO7,CO8	Perform <i>Vaippu muraikal (Veeram, Rasa karpooram, Lingam)</i> mentioned by various Siddhars	2	Practical Training 21.5	PSY-GUD	Shows-how	L&PPT ,L,DIS
CO1,CO2,CO6 ,CO7,CO8	Perform various purification Techniques – <i>Rasam, Veeram, Pooram, Lingam</i>	3	Practical Training 21.6	PSY-GUD	Shows-how	W,L&GD ,DL
CO1,CO2,CO6 ,CO7,CO8	Describe the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics.	1	Lecture	CAP	Knows-how	LS,L&G D,DIS
CO1,CO2,CO6 ,CO7,CO8	Describe organo - Mercurial compounds	1	Lecture	CC	Knows-how	L,L&PPT
CO1,CO2,CO6 ,CO7,CO8	Perform Systemic analysis of research articles pertaining to Mercurial compounds and formulation which contain mercurial compounds and publish minimum of one research article in scientific publication medium.	3	Experiential-Learning 21.6	CAP	Does	TBL,LRI, L&PPT ,L&GD
CO1,CO2,CO6 ,CO7,CO8	Document Systemic analysis of research articles pertaining to Mercurial compounds and formulation which contain mercurial compounds.	4	Experiential-Learning 21.7	PSY-GUD	Does	LRI

CO1,CO2,CO5 ,CO6,CO8	Visit to National Metallurgic Laboratory, Central Drug Research Institute, Geological Survey of India, Institute of Minerals and Material Technology	7	Experiential-Learning 21.8	AFT-SET	Does	LRI,L&G D,FV
CO1,CO2,CO5 ,CO6,CO8	Observe extraction method for extraction of metal from its ore.	5	Experiential-Learning 21.9	AFT-VAL	Does	L&GD,FV

Practical Training Activity

Practical Training 21.1 : Various purification methods - *Sembu*

Total learning hour: 5

Activity 1- Practical (Lecture with group discussion) - 30 minutes

Step 1: The instructor clearly defines the objectives of the practical class, like Identification of raw drug, substitute of the raw drug, purification technique and other various purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, Precaution Methods, conducting assessments, and identifying management approaches

Step 2: Formation of groups

The students will be divided into two(Maximum 3)

Step 3 : Things needed for the practical will be distributed among the students.

Step 4 : Each student must carry out any two various purification methods of *sembu*

Activity 2 - Demonstration in Lab - Conduct the Experiment: 4 hours

1. Various Purification Techniques of *Sembu*

Step 1: Students will be asked to summarise the procedure – 5 minutes

Step 2 : Group discussions will be held on the basis of that experiments and further other purification techniques mentioned in Siddha literature will be discussed -10 minutes.

Step 3: Personalised feedback will be collected at the completion of the practical hours .-10 Minutes

Step 4: Record the data and document it in record notebook. - 5 minutes.

Practical Training 21.2 : Extraction of *Karuvangam* (Lead) from *Mirutharsingi*

Total learning hour: 2 hours

Activity 1: Practical (Lecture with Group discussion)

The teacher clearly explains the objectives of the practical session and the overview of extraction methods, performing assessments and exploring management

strategies -10 minutes

Step2: Group Formation:

a. Students should be grouped into two (Maximum 3)

Step3 - Required items for the practical's will be issued to the students.

Step4 - Each group will be provided with Collected / Procured *Mirutharsingi*

Step5 - Each group should perform extraction of Lead from *Mirutharsingi* using Traditional Methods Mentioned in Various siddha literature.

Activity 2: Demonstration

Step 1 : Conduct the experiment- 1 hour 30 minutes

Step 2: Group discussions will be conducted based on various extraction methods mentioned in our siddha texts. -5 minutes.

Step 3: Personalised feedback will be collected -5 Minutes

Step 4: Record the data and document it. Detailed report submitted. - 10 minutes

Practical Training 21.3 : Various purification methods – *Velli, Naagam*

Total learning hour: 5

Step1- Practical (Lecture with group discussion)

Step 1: The instructor clearly defines the objectives of the practical class, like

Identification of raw drug, substitute of the raw drug, purification technique and other various purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, Precaution Methods, conducting assessments, and identifying management approaches- 30 minutes

Step 2: Formation of groups

The students will be divided into two(Maximum 3)

Step 3 : Things needed for the practical will be distributed among the students.

Step 4 : Each student must carry out any two purification methods mentioned in various siddha literature

Step2 - Demonstration in Lab - Conduct the Experiment: 2 hours

1. Various Purification Techniques of *Velli*

2. Various Purification Techniques of *Nagam*

Step 1: Students will be asked to summarise the procedure – 5 minutes

Step 2 : Group discussions will be held on the basis of that experiments and further other purification techniques mentioned in Siddha literature will be discussed -10 minutes.

Step 3: Personalised feedback will be collected at the completion of the practical hours -10 Minutes

Step 4: Record the data and document it in record notebook. - 5 minutes.

Practical Training 21.4 : Purification of *Velvangam* and *Karuvangam*

Total Learning hour: 5

Activity 1 - Lecture

Procedure Should be performed in Gunapadam Marunthiyal lab. Teacher should Clearly explain the identification, Purification Procedure and Precautions during the procedure to the students – 30 minutes

Activity 2 - Demonstration in lab

Students should be divided into small groups. Each Group should be provided with Raw Drugs and required materials

Each student should perform the Purification techniques as mentioned in Siddha text.

Step 2 - Conduct the Experiment: 2 hours for each raw drug (Totally 4 hours)

a. Various methods of Purification of Karuvangam

b. Various methods of Purification of Velvangam

STEP 3 - Student should have to demonstrate the procedure. – 5 minutes

Activity 3 - Discussion

Group discussions will be conducted based on the purification technique and further various purification techniques mentioned in Siddha literature will be discussed -15 minutes.

Step 1 -Personalised feedback will be collected. -5 Minutes

Step 2 - Record the data and document it in record notebook. - 5 minutes

Practical Training 21.5 : Vaippu muraikal - *Veeram*, *Rasa karpooram*, *Lingam*

Total learning hour: 2

Activity 1- Practical(Lecture with group discussion)

Step1: The teacher clearly describes the objectives of the practical session, such as Identification of raw drug, substitute of the raw drug, *Vaippu muraikal* & its importance, performing assessments, and exploring management strategies- 15 minutes

Step 2 : Group Formation:

a. Students shall be grouped into two (Maximum 3)

Step 3 - Required items for the practical's will be issued to the students.

Step 4 – Each student should perform any one of the given *Vaippu muraikal*

Activity 2 - Demonstration

Conduct the Experiment: 1 hour 30 minutes total

- a. *Vaippu murai - Veeram*
- b. *Vaippu murai- Rasa karpooram*
- c. *Vaippu murai - Lingam*

Step 1: Group discussions will be conducted based on the experiments and further various purification techniques mentioned in Siddha literature will be discussed -5 minutes.

Step 2 : Personalised feedback will be collected. At the end of the practical hours -5 Minutes

Step 3: Record the data and document it in record notebook. - 5 minutes

Practical Training 21.6 : Various purification Techniques – *Rasam, Veeram, Pooram, Lingam*

Activity 1- Practical (Lecture with group discussion)

Step 1: The instructor clearly defines the objectives of the practical class, like

Identification of raw drug, substitute of the raw drug, purification technique and other various purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, Precaution Methods, conducting assessments, and identifying management approaches- 30 minutes

Step 2: Formation of groups:

- a. The students will be divided into two(Maximum 3)

Step 3: Things needed for the practical will be distributed among the students.

Step 4 : Each student must carry out any one of the purification methods mentioned for one raw drug

Activity 2 - Demonstration in Lab - Conduct the Experiment: 2 hours

- a. Various Purification Techniques of *Rasam*
- b. Various Purification Techniques of *Veeram*
- c. Various purification Techniques of *Pooram*
- d. Various Purification Techniques of *Lingam*

Step 1: Students will be asked to summarise the procedure – 5 minutes

Step 2 : Group discussions will be held on the basis of that experiments and further other purification techniques mentioned in Siddha literature will be discussed -10 minutes.

Step 3: Personalised feedback will be collected at the completion of the practical hours.-10 Minutes

Step 4: Record the data and document it in record notebook. - 5 minutes.

Experiential learning Activity

Experiential-Learning 21.1 : Meta analysis- publish research articles

Total Learning Hour - 1

Activity 1: lecture with group discussion

Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly.- 5 minutes

Activity 2: presentation

Step 1 : Perform Systemic analysis of research articles related to ulogangal or Related to above said drug

Step 2: Student to prepare the review protocol including inclusion and exclusion criteria article to be included- 10 minutes

Step 3: Student should relevant to the research article as per the protocol- 30 minutes

- *Ayam*

Step 4: Interpret and Report Results- 15 minutes

Summarize the findings of the meta-analysis.

Discuss the implications of the results in the context of existing literature.

Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).

Follow reporting guidelines (PRISMA).

Student should publish one research article in any Indexed Journals

Experiential-Learning 21.2 : Meta analysis- publish research articles

Total Learning Hour - 1

Activity 1: lecture with group discussion

Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly.- 10 minutes

Activity 2: Presentation

Step 1 :Perform Systemic analysis of research articles related to ulogangal or Related to above said drug

Step 2:Student to prepare the review protocol including inclusion and exclusion criteria article to be included- 5 minutes

Step 3:Student should relevant to the research article as per the protocol- 30 minutes

Sembu

Step 4: Interpret and Report Results- 15 minutes

Summarize the findings of the meta-analysis.

Discuss the implications of the results in the context of existing literature.
Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).
Follow reporting guidelines (PRISMA).
Student should publish one research article in any Indexed Journals

Experiential-Learning 21.3 : Identify the testing method of purified *Kaantham*

Total Learning hour - 1
Activity 1 : Lecture - 10 minutes
Instructor clearly explain the Kaantham , and its varieties, and purification techniques in .
traditional testing method
Step 2- Demonstration -40 minutes
Students will be asked to Identify the raw drugs.
Perform the step-by-step procedure for traditional purification techniques of purifying Kaantham.
Step 3- Differentiate and justify the purified vs unpurified Kaantham.- 5 minutes
Step 4 - Record the data in the record notebook - 5 minutes

Experiential-Learning 21.4 : Assignment on History of *Panchasootham*

Total Learning hour- 1
The students are asked to submit the assignment on the history of Panchasootham.
This assignment should follow the following criteria.

- Introduction-Historical/Cultural Context -15 minutes
- Origin of the vernacular name - 10 minutes
- Availability of natural ores - 10 minutes
- Therapeutic uses of the raw drugs used by Traditional practitioners (Vaithiyars) -10 minutes
- Conclusion-Summarize your key learning points and reflect on the overall impact of the experience. -10 minutes
- Reference- provide a list of all sources and cited. - 5 minutes

Experiential-Learning 21.5 : Meta analysis- publish research articles

Total Learning Hour - 3

Activity 1:

Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly.- 30 minutes

Activity 2:

Perform Systemic analysis of research articles related to ulogangal or Related to above said drug

Activity 3:

Each students should allotted with either metal or mineral drug(one)

Activity 4:

student to prepare the review protocol including inclusion and exclusion criteria article to be included- 30 minutes

Activity 5:

Student should relevant to the research article as per the protocol- 1 hour 30 minutes

Ayam, Sembu, Velli, Thangam, Vangam, Velvangam, Mirutharsinghi, Ekku, Mandooram, Kaantham

Activity 6:

Interpret and Report Results- 30 minutes

- Summarize the findings of the meta-analysis.
- Discuss the implications of the results in the context of existing literature.
- Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).
- Follow reporting guidelines (PRISMA).
- Student should publish one research article in any Indexed Journals.

Experiential-Learning 21.6 : Publication of mercurial compound- *veeram, pooram*

Total Learning Hour – 4

Activity 1: Flipped class room

Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly.- 30 minutes

Step 2: 3 hours

Perform Systemic analysis of research articles related to *Panchasootham*

Each students should allotted with either one metal or mineral drug student to prepare the review protocol including inclusion and exclusion criteria article to be included- Student should relevant to the research article as per the protocol- 3 hour

1. *Veeram* 2. *Pooram*

Activity 2: Lab report interpretation

Interpret and Report Results: - 30 minutes

- Summarize the findings of the meta-analysis.
- Discuss the implications of the results in the context of existing literature.
- Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).
- Follow reporting guidelines (PRISMA).
- Student should publish one research article in any Indexed Journals.

Experiential-Learning 21.7 : Publication- mercurial compounds

Total Learning Hour – 4

Activity 1: Flipped class room

Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly.- 30 minutes

Step 2: 3 hours

Perform Systemic analysis of research articles related to *Panchasootham*

Each students should allotted with either one metal or mineral drug student to prepare the review protocol including inclusion and exclusion criteria article to be included- Student should relevant to the research article as per the protocol

1. *Rasam*, 2. *Lingam*

Activity 2: Lab report interpretation -30 minutes

Summarize the findings of the meta-analysis.

Discuss the implications of the results in the context of existing literature.

Acknowledge limitations of the meta-analysis (e.g.heterogeneity, publication bias).

Follow reporting guidelines (PRISMA).

Student should publish one research article in any Indexed Journals.

Experiential-Learning 21.8 : Field visit- National Metallurgic Laboratory, Central Drug Research Institute, Geological Survey of India, Institute of Minerals and Material Technology

Total learning hour-7

Activity 1: Field visit - 4 hours

Brief overview on Natural ores, and collection methods, metallurgical processes, equipment, research areas, safety guidelines , set of questions to guide their observation given to the student priorly - 30 minutes

Group of Students should visit institute of National metallurgic laboratory/ Central drug research institute/Geological survey of India/ Institute of minerals and material technology - 3 hours

Observation:

Materials Characterization, Corrosion Engineering, Mineral Processing, High-Temperature Processing ,Foundry and Casting, Mechanical Testing - 30 minutes

Activity 2: Lecture with group discussion - 15 mins

Step 1: Q&A Session:- 30 minutes

Allocate time for a question-and-answer session with NML researchers and staff with students.

Step 2: Debriefing and Discussion: - 15 minutes

Conduct a debriefing session to discuss the students' observations and experiences. Review the key concepts and processes observed during the visit.

Lab Report interpretation -45 minutes

Step 1: Report Writing: 15 minutes

students to write a report summarizing their observations and learnings.

The report should include a description of the processes observed, the equipment used, and the application of metallurgical principles.

Step 2 :Presentation:- 15 minutes

Students to prepare presentations on specific aspects of the visit.

Step 3: Feedback and Evaluation – 15 minutes

Personalized feed back will be collected to evaluate the effectiveness of the field visit. Use the feedback to improve future field visit - 30 minutes

Experiential-Learning 21.9 : Extraction Procedure- Metallic ore (*Panchasootham*)

Total Learning hour- 5

Activity 1: Experiential Learning - Field visit - 4 hours

A brief overview of Extraction Procedure - Metallic ore should be given to the students priorly.
 Group of 10 Students Shall have to visit Various places/Mineral mines for collection of Mineral ore.
 Student will have to collect at least 1 different ore.
 They will be guided by Experts from the field of Minerology, to improve their skills in methods of ore collection.
 All student shall have to authenticate the mineral based on Physical examination
 Lecture with group Discussion 1 hour
 Conduct the workshop with interaction and lecture for the identification of the metallic ore, and Extraction procedure of metals from Metallic ore, Student s will be made to perform the Extraction methods in the presence of experts.
 Students shall have to prepare assignment of Step-by-step extraction procedure techniques.

Modular Assessment

Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks. - Multiple Choice Questions – 10 Marks - Total of 20 questions - each question carries 0.5 marks - No Negative Marks - Structured Essay questions - 15 Marks - Objective Structured Practical examination – 20 Marks - Each student shall have to do any one Suthi Murai or Vaippu Murai - Spotter Identification – 5 marks - There shall be 5 spotters - Each spotter carries 1 mark Or Any practical in converted form can be taken for assessment.(25 Marks) and Any of the experiential can be taken as an assessment.(25 Marks)	4

Module 22 : Paadanankal and Karasaram (Arsenic Compounds and Salts, Alkalies)

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe General characteristics, Therapeutic uses, Mechanism of action of mineral drugs - Paadanangal and Karasarangal

Conduct Various purification process and vaippu methods of minerals drugs – Paadanangal and Karasarangal

Apply the Knowledge of Siddha Marunthiyal in Research to figure out the mechanism of action, ADME of siddha medications of paadanangal and Karasarangal.

M 22 Unit 1 Gandhagam (Sulphur), Anjanakal (Antimony)

22.1.1 Origin, Reason for Synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *pagai sarakku* (agonist and antagonist), Peculiar characteristic, Varieties, Medicinal uses, *Nanju kurigunam* (Toxic symptoms) and *murivu* (antidote), scientific aspects of following 22.1.1.1 *Gandhagam* (Sulphur)

22.1.1.2 *Anjanakal* (Antimony) 22.1.2. Vaippu muraikal

22.1.3. Various purification Techniques

22.1.4. Biological roles

22.1.5. Formulations

22.1.6 Meta-analysis of recent research

References: 27,111,116,138,152,205,206,234,276,278,279,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Reason for being <i>Natpu sarakku</i> and <i>pakai sarakku</i> , Peculiar characteristic, Varieties, <i>Nanju kurigunam</i> and <i>murivu</i> , scientific aspects of following <i>Gandhagam</i> , <i>Anjanakal</i>	1	Lecture	CAP	Knows-how	DL,L&G D,L&PPT
CO1,CO2,CO6,CO7,CO8	Perform Vaippu muraikal - <i>Nelikai Gandhi vaippu</i> mentioned by various Siddhars	2	Practical Training 22.1	PSY-GUD	Shows-how	DL,W,L&GD

CO1,CO2,CO6,CO7,CO8	Perform various purification Techniques- <i>Gandhagam, Anjanakal</i>	2	Practical Training 22.2	PSY-MEC	Shows-how	DIS,DL,L &GD
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	2	Experiential-Learning 22.1	AFT-CHR	Does	DIS
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokineticsop teaching ability	1	Experiential-Learning 22.2	CAP	Does	IBL,L&P PT ,DIS
CO1,CO2,CO6,CO7,CO8	Perform Meta-analysis of research articles and publish minimum of one research article in scientific publication medium	4	Experiential-Learning 22.3	AFT-CHR	Does	DIS,L&P PT
CO1,CO2,CO6,CO7,CO8	Perform various purification Techniques of <i>Paadanangal</i>	2	Practical Training 22.3	PSY-GUD	Shows-how	RLE,TBL ,L_VC,W
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs,Toxicokinetics	2	Experiential-Learning 22.4	CAP	Does	DIS,L&GD
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs,Toxicokinetics	1	Experiential-Learning 22.5	CAP	Does	L&GD,DIS

M 22 Unit 2 Gowri paadanam (Arsenic compound),Vellai paadanam (Arsenium Acidum),Thalagam(Arsenic Tri Sulphidum),Manosilai(Arsenic Di Sulphidum),Kuthiraipal paadanam (Feldspar)

22.2.1. Origin, Reason for Synonyms, Organoleptic characters, Reason for being *Natpu sarakku* and *pagai sarakku* (agonist and antagonist), Peculiar characteristic, Varieties, Medicinal uses, *Nanju kurigunam* (Toxic symptoms) and *murivu* (antidote), scientific aspects of following

22.2.1.1 *Gowri Paadanam* - Yellow oxide of arsenic

22.2.1.2 *Vellai paadanam* - White arsenic

22.2.1.3 *Thalagam* - Yellow arsenic

- 22.2.1.4 *Manosilai* - Realger
 22.2.1.5 *Kuthiraipal paadanam* - orthoclase 22.2.2. Vaippu muraikal
 22.2.3. Various purification Techniques
 22.2.4. Biological roles
 22.2.5. Formulations
 22.2.6. Meta-analysis of recent research

References: 27,111,116,138,205,206,234,279,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and Pakai sarakku, Peculiar characteristic, Varieties, Nanju kurikunam and murivu, scientific aspects of following <i>Gowri Paadanam, Vellai paadanam, Thalagam, Manosilai, Kuthiraipal paadanam</i>	3	Lecture	CAP	Knows-how	L&GD,L &PPT,DIS
CO1,CO2,CO6,CO7,CO8	Perform <i>Gowri paadanam, Vellai paadanam, Thalagam, Manosilai</i> and <i>Kuthiraipal paadanam</i> Vaippu muraikal mentioned by various Siddhars	2	Practical Training 22.4	PSY-GUD	Shows-how	DIS,DL,L &GD
CO1,CO2,CO6,CO7,CO8	Perform Meta-analysis of research articles and publish minimum of one research article in scientific publication medium	4	Experiential-Learning 22.6	AFT-CHR	Does	ML,DA

M 22 Unit 3 Alkaline metals and alkaline earth materials

- 22.3.1. Role of Sodium and potassium in Health, Sodium potassium pump
 22.3.2. Role of *Chunna sathu* (calcium) in medicine
 22.3.3. Muscle contraction and relaxation experiments using drugs that contains sodium and calcium ole of Sodium and potassium in Health, Sodium potassium pump

References: 138,152,205,234,276,278

3A	3B	3C	3D	3E	3F	3G
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CO4,CO5	Describe the Role of Sodium and Potassium in Health, Sodium Potassium pump	1	Lecture	CAP	Knows-how	L,L_VC
CO4,CO5	Describe the Role of Calcium in medicine, compare with Siddha formulation	1	Lecture	CAP	Knows-how	L&PPT
CO4,CO5	Perform invitro muscle contraction and relaxation experiments using drugs that contains sodium, potassium and calcium	1	Practical Training 22.5	PSY-GUD	Shows-how	L&GD,L &PPT ,DIS

M 22 Unit 4 Karasaram- salts and alkalies

(Sources, Reason for synonyms, Organoleptic characters, Peculiar characteristics, Medicinal uses, Scientific aspects of following) 22.4.1. *Appalakaram* - Sodium Bicarbonate

22.4.2. *Yavatcharam* - Potassium carbonate

22.4.3. *Sathicharam* - Bentonite clay

22.4.4. *Savukaaram* - Hydrous sodium carbonate

22.4.5. *Seenakkaram*- Potash Alum

22.4.6. *Navatcharam* - Ammonium chloride

22.4.7. *Vangaala patchai* - Sub acetate of Copper

22.4.8. *Soodan* - Camphor

22.4.9. *Pachaikarpooram* - Borneo Camphor

References: 27,110,111,138,152,205,206,234,276,278,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6 ,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Reason for being Natpu sarakku and Pakai sarakku, Peculiar characteristic, Varieties, Nanju kurigunam and murivu, scientific aspects of following <i>Appalakaram, Yavatcharam, Sathisaaram, Savukaram, Seenakaram, Navatcharam, Vangaal patchai, Soodan, Pachaikarpooram</i>	2	Lecture	CC	Knows-how	DIS,L&P PT ,L&GD

CO1,CO2,CO6,CO7,CO8	Perform Vaippu muraikal (<i>Navatcharam, Padikaram, Pachai Karpooram, Venkaram</i>) mentioned by various Siddhars	2	Practical Training 22.6	PSY-GUD	Shows-how	DIS,L&GD,L_VC
CO1,CO2,CO6,CO7,CO8	Perform extraction of <i>Yavaatchaaram</i> - Potassium Carbonate from ashes of <i>yava gothumai</i> (Type of wheat)	2	Practical Training 22.7	PSY-GUD	Shows-how	W,L_VC,DIS
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	3	Experiential-Learning 22.7	CAN	Does	IBL
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1	Experiential-Learning 22.8	CAP	Does	L&GD,DIS
CO1,CO2,CO6,CO7,CO8	Perform test for assessing acidity and basicity of any • Litmus paper test • Phenolphthelin test • Methyl orange test • Determination of PH using PH meter	1	Practical Training 22.8	PSY-GUD	Shows-how	DIS,D
CO1,CO2,CO6,CO7,CO8	Perform Systemic - analysis of research articles and publish minimum of one research article in scientific publication medium	5	Experiential-Learning 22.9	AFT-CHR	Does	L_VC,DIS

M 22 Unit 5 Uppukal(Salts)

(Origin, Reason for synonyms, Organoleptic characters, Peculiar characteristics, Medicinal uses, Scientific aspects of following) 22.5.1. *Indhuppu* - Rock Salt
22.5.2. *Attuppu* - Extracted salt from salt petre
22.4.3. *Kallupu* - Marine phosphorities
22.4.4. *Kariuppu* - Sodium chloride
22.4.5. *Savuttuppu* - Extracted salt from pooneru

- 22.4.6. *Pooneru* - Fuller's Earth
 22.4.7. *Vediuppu* - Potassium nitrate
 22.4.8. *Venkaram* - Borax
 22.4.9. *Pidalavanam* - Black Salt
 22.4.10. *Kanthilavanam* -Sodium sulphate
 22.4.11. *Ambar* - Ambra Garasea

References: 27,111,138,152,205,206,234,276,278,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Peculiar characteristics, Varieties, scientific aspects of following <i>Indhuppu, Attuppu, Kallupu, Kariuppu, Savuttuppu, Pooneru, Vediuppu, Pidalavanam, Venkaram, Kanthilavanam, Ambar</i>	2	Lecture	CC	Knows-how	L&PPT,DL,FV
CO1,CO2,CO6,CO7,CO8	Perform <i>Indhuppu Vaippu muraikal</i> mentioned by various Siddhars	2	Practical Training 22.9	PSY-GUD	Shows-how	DL,L&G D
CO1,CO2,CO6,CO7,CO8	Perform various purification Techniques – <i>Vediuppu, Pooneru Thetchai</i>	2	Practical Training 22.10	PSY-GUD	Shows-how	D,L_VC, EDU
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparison of Siddha and modern drugs	2	Experiential-Learning 22.10	CAP	Does	D,ML,IB L,L&PPT
CO1,CO2,CO6,CO7,CO8	Discuss the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparison of Siddha and modern drugs	1	Experiential-Learning 22.11	AFT-CHR	Does	L_VC,DIS
CO1,CO2,CO6,CO7	Perform test for assessing acidity and basicity of any Karasaram	2	Practical Training 22.11	PSY-GUD	Shows-how	DL,L_VC

	1. Litmus paper test 2. Phenolphthelin test 3. Methyl orange test					
	Determination of PH using PH meter					
Practical Training Activity						
Practical Training 22.1 : Perform Vaippu muraikal - <i>Nelikai Gandhi vaippu</i>						
Total learning hour: 2 Activity 1: Lecture with Discussion Step 1: The teacher should detail the objective of the practical session, such as Identification of raw drugs, Procedure for performing Vaippu Muraigal (10 minutes) Step 2 :Group Formation a.Students shall be grouped into two (Minimum 2, Maximum 3) Step 3 :The materials required for the Practical should be provided to Students. Step 4 : Any one of the Vaippu Murai should be assigned to each group. Activity 2: Demonstration Lab / Workshop Step 1 : Conduct the Vaippu murai procedure: 1 hour allocation. Nellikai Gandhi Vaippu Step 2 : Students were asked to Demonstrate the procedure by 10 minutes. Step 3 : Based on demonstration small group discussions will be conducted, and the various methods used for Vaippu Murai should be discussed - 15 minutes. Step 4 : Personalised feedback will be collected. (5 minutes) Step 5 :Record the data and document it in record notebook. (20 minutes)						
Practical Training 22.2 : Various purification Techniques- <i>Gandhagam, Anjanakal</i>						
Total learning hour: 2 Activity 1 Practical (Discussion) Step 1- The teacher clearly describes the objectives of the practical session, such as Identification of raw drug, purification techniques and other various purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, performing assessments, and exploring management strategies- 30 minutes Step 2 - Students Shall be Grouped into 2 Groups						

Grouped Students should perform the procedure in Gunapadam Marunthiyal Laboratory Step 3 -Students of each group should Identify the Required Raw Drugs.

Activity 2: Demonstration lab

Step 1 - Students of each group Shall have to perform any one of the Purification Technique Mentioned in the Siddha Texts for the following Raw Drugs – 1 Hour

a. *Gandhagam*

b. *Anjanakkal*

Step 2 - Student should have to summarise the procedure. – 5 minutes

Step 3 - Group discussions will be conducted based on the experiments and further various purification methods mentioned in Siddha literature and followed by traditional practitioners will be discussed -15 minutes.

Step 4 -Personalised feedback will be collected. Viva-voce sessions will be conducted at the end of the practical hours -5 Minutes

Step 5 - Record the data and document it. - 5 minutes

Practical Training 22.3 : Various purification Techniques of *Paadanangal* - *Gowri paadanam*, *Vellai paadanam*, *Thalagam*, *Manosilai*, *Kuthiraipal paadanam*

Total Learning hour- 2

Activity 1: Lecture with video clips

Step 1- The teacher clearly explain the objectives of the practical session, such as Identification of raw drug, purification techniques and other various purification techniques, and importance of purification, performing assessments, and exploring management strategies- 30 minutes

Step 2- Practical Group Formation:

a. Students shall be grouped into two (Maximum 3)

Step 3 - Students of each group should Identify the Required Raw Drugs.

Required materials for the practical will be issued to the students.

Step 4 - Conduct the Experiment: 1 hour

Students of each group Shall have to perform any one of the following Paadanam purification (any two methods) Mentioned in the Siddha Texts.

- *Gowri paadanam*
- *Vellai paadanam*
- *Thalagam*
- *Manosilai*
- *Kuthiraipal paadanam*

Step 5 - Group discussions will be conducted based on the procedure. -10 minutes. Further various purification methods mentioned in siddha literature will be discussed.
 Step 6: Personalised feedback will be collected. Q/A sessions will be conducted at the end of the practical hours .-10 Minutes
 Step 7: Record the data and document it submit it in detailed report. - 10 minutes

Practical Training 22.4 : Vaippu muraikkal - *Gowri paadanam, Vellai paadanam, Thalagam, Manosilai* and *Kuthiraipal paadanam*.

Total learning hour: 2

Activity 1 : Group discussion

Step 1- The teacher clearly explains the objectives of the practical session, such as Identification of raw drug, Vaippu muraikal & its importance, performing assessments, and exploring management strategies- 30 minutes

Step 2: Group Formation

a. Students shall be grouped into two (Maximum 3)

Step 3 - Students of each group shall Identify the Raw Drugs Required.

Required materials for the practical's will be issued to the students.

Activity 2 - Practical -1 hour

Step 1- Students of each group Shall have to perform any one of the Vaippu Muraikal Mentioned in the Siddha Texts for the following

- *Gowri paadanam*
- *Vellai paadanam*
- *Thalagam*
- *Manosilai*
- *Kuthiraipal paadanam*

Step 2 - Group discussions will be conducted based on those experiments. and further discussion of various Vaippu Muraikal followed by tractional practioners -10 minutes.

Step 3: Personalised feedback will be collected. Q/A sessions will be conducted at the end of the practical hours -10 Minutes

Step 4: Record the data and document it submitted in detailed report. - 10 minutes

Practical Training 22.5 : Experiments - Invitro muscle contraction and relaxation experiments using drugs that contains sodium, potassium and calcium

Total learning hours-1hour

Step 1 - Teacher should clearly explain the fundamentals of muscle contraction and relaxation studies.

(10 Minutes)

Step 2 - Students should be trained prior on operation of kymograph, Experimental procedure and

Interpretation of the results obtained.(20 minutes)

Step 3 - Students should be allotted with various drugs of kara saram in order to perform the Practical (15 minutes) Step 4 - Students Should demonstrate the procedure- (5 Minutes) Step 5 - Students should interpret the study results and make a final report.- (5 Minutes) Step 6 - Post Activity Discussions - (5 Minutes)
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Practical Training 22.6 : Vaippu muraikal (*Navatcharam, Padikaram, Pachai karpooram, Venkaram*)

Total learning hour: 2

Activity 1: Discussion

Step 1 - The teacher clearly explain the objectives of the practical session, such as Identification of raw drug, Vaippu muraikal & its importance, performing assessments, and exploring management strategies- 30 minutes

Step 2 - Group Formation:

a. Students shall be grouped into two(Maximum 3)

Step 3 - Students of each group should Identify the Required Raw Drugs.

Required materials for the practical will be issued to the students.

Activity 2 -Practical-1 hour

Students of each group Shall have to perform any one of the vaippu muraikal Mentioned in the Siddha Texts for the following Raw Drugs

a. *Navatcharam*

b. *Padikaram*

c. *Pachai karpooram*

d. *Venkaram*

Step 5 - Group discussions will be conducted based on the experiments and further various vaippu muraikal mentioned in Siddha literature will be discussed -10 minutes.

Step 6 - Personalised feedback will be collected. Viva-voce sessions will be conducted at the end of the practical hours .-10 Minutes

Step 7- Record the data and document it submit it in detailed report. - 10 minutes

Practical Training 22.7 : Extraction of Yavaatchaaram- Potassium Carbonate from ashes of Yava gothumai (Type of wheat)

Total learning hour: 2 hours

Activity 1: Lecture with videoclips

Step 1: The teacher clearly outlines the objectives of the practical session and should discuss the overview of extraction methods, performing assessments and exploring management strategies- 30 minutes

Activity 2 : Practical

Step 1: Group Formation

a. Students should be grouped into two (Maximum 3)

Step 2 - Required materials for the practical's will be issued to the students.

Step 3 - Conduct the experiment- 1 hour

Each group should perform extraction of *Yavaatchaaram* - Potassium carbonate salt from wood ashes using Traditional Uppu extraction methods from plants using Traditional Method Mentioned in Gunapadam Thaathu Jeeva Vaguppu

Step 4 - Group discussions will be conducted based on the procedure, and further discussion will be on various samples used for these tests. -10 minutes.

Step 5 - Personalised feedback will be collected. -10 Minutes

Step 6 - Record the data and document it - 10 minutes

Practical Training 22.8 : Test for assessing acidity and basicity of Siddha drugs

- Litmus paper test
- Phenolphthelin test
- Methyl orange test
- Determination of PH using PH meter

Total learning hour: 1

Activity 1 : Demonstration

Step 1: The Teacher should clearly explain the objective of the practical session, such as Identification of raw drugs, detailed explanation of the tests for assessing acidity and basicity of the drugs (5 mins)

Step 2 - Group Formation

Students are grouped into two or three (Minimum 2, Maximum 4)

The required materials for practical should be provided to the students.

Sample should be prepared by 5minutes (Kaarangal)

Step 3 - One sample should be assigned to each Student.

Activity 2 : Practical

Step 1- Conducting the Experiment: 30 minutes allocated for this procedure.

I.Tests for Acidity

a. Litmus Paper Test

b. Phenolphthalein Test

c. Methyl orange Test

II.Tests for PH

PH determined using PH meter

Step 2 - Demonstration by Students- 5 minutes.

Small group discussions will be conducted based on the experiment, and further various other samples used for these tests will be discussed -5 minutes.

Step 3 - Personalised feedback will be collected. - 5 minutes

Step 4 - Record the data and document it - 5 minutes

Practical Training 22.9 : *Vaippu muraikal - Indhuppu*

Total learning hour: 2

Activity 1: Lecture with Group Discussion

Step 1- The teacher clearly describes the objectives of the practical session, such as Identification of raw drug, *Vaippu muraikal* & its importance - 30 minutes

Step 2 - Group Formation

Students shall be grouped into two (Maximum 3)

Step 3 - Required material for the practical will be issued to the students.

Activity 2 : Demonstration in lab

Step 1 - Conduct the Experiment: 1 hour

Each group students should be instructed to perform any methods of *Vaippu Murai* mentioned in the Siddha classical Texts.

a. *Vaippu murai - Indhuppu*

Step 2: Group discussions will be conducted based on the procedure and further various *Vaippu Muraikal* mentioned in siddha literature will be discussed -10 minutes.

Step 3: Personalised feedback will be collected. At the end of the practical hours, Q/A sessions will be conducted-10 Minutes

Step 4: Record the data and submit it in detailed report. - 10 minutes

Practical Training 22.10 : Various purification Techniques – *Vediuppu ,Pooneeru Thetchai*

Total learning hours - 2

Activity 1- Practical (Edutainment)

Step 1: The teacher clearly outlines the objectives of the practical session, such as Identification of raw drug, purification techniques and other various purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, Precaution Methods , before the practical session, video clips relevant to the practical session will be shown for 30 minutes.

Step 2 - Students Shall be Grouped into 2 Groups

Step 3 - Grouped Students should perform the procedure at Gunapadam Marunthiyal Laboratory

Step 4 - Each group of students should Identify the Required Raw Drugs.

Activity 2: Demonstration

Step 1 - Students of each group Should have to perform any two various purification Technique in one raw drug Mentioned in the Siddha Texts for the following Raw Drugs – 1 hour

Various purification of *Vediuppu*

Various Purification of *Pooneeru*

Step 2 - Students will be asked to Summarise the Procedure

Group discussions will be conducted based on that experiments and further various purification techniques mentioned in Siddha literature will be discussed -15 minutes.

Step 3 - Personalised feedback will be collected. At the end of the practical hours, Q/A sessions will be conducted -10 Minutes

Step 4 - Record the data and document it - 5 minutes.

Practical Training 22.11 : Perform test for assessing acidity and basicity of any *Karasaaram*

1. Litmus paper test

2. Phenolphthelin test

3. Methyl orange test Determination of PH using PH meter

Total learning hour: 2

Activity 1: Practical(Lecture with video clips)

The Teacher should clearly establish the objectives of the practical session, such as Identification of raw drugs, detailed explanation of the tests for assessing acidity and basicity of the drugs. Before the practical session, video clips will be shown for the following test (10 mins)

Step 2 - Group Formation

Students are grouped into two or three (Minimum 2, Maximum 4)

Step 3 – Any one of Karasaram should be provided to each group.

Step 4 – Sample should be prepared by using the given Karasaram 30 minutes(Uppukal).

Activity 2 : Demonstration

Step 1: Conducting the Experiment: 30 minutes allocated to each sample(1 Hour)

I.Tests for Acidity

1. Litmus Paper Test
2. Phenolphthalein Test
3. Methyl orange Test

II.Tests for PH

1. PH determination using PH meter

Step 2 - Demonstration by Students- 5 minutes.

Small group discussions will be conducted based on that, and further discussion will be on various samples used for these tests. -5 minutes.

Step 3 - Personalised feedback will be collected. - 5 minutes

Step 4 - Record the data and document it - 5 minutes

Experiential learning Activity

Experiential-Learning 22.1 : Biological role - ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics

Total learning hour -2

Activity 1 - Flipped class room

1. Explain the clear concise explanations of the core concepts, emphasizing their relevance to real world- word scenario (Eg. Drug action, toxicology), Role play or simulation modelling, case study analysis - 30 minutes
2. Groups of students instruct them.
3. Assignment on Analysis of Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetic of Arsenic and its Compounds and its

applications in siddha system of Medicine. - 1 hour

Activity 2: Discussions

Debriefing Sessions-Discuss the key steps of ADME the factors that influence each step, and the consequences of enzyme inhibition or activation. - 15 minutes

Report writing: Write the report and summarizing their findings from case studies or findings- 15 minutes

Experiential-Learning 22.2 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics

Total learning hour -1 Flipped class room

1. Explain the clear concise explanations of the core concepts, emphasizing their relevance to real world- word scenario (Eg. Drug action, toxicology), Role play or simulation modelling, case study analysis - 30 minutes

2. Groups of students instruct them.

3. Assignment on Analysis of Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetic of Arsenic and its Compounds and its applications in siddha system of Medicine.

Activity 2: Discussions

4. Debriefing Sessions-Discuss the key steps of ADME the factors that influence each step, and the consequences of enzyme inhibition or activation. - 15 minutes

5. Report writing: Write the report and summarizing their findings from case studies or findings- 15 minutes

Experiential-Learning 22.3 : Meta analysis Research article publication

Total Learning Hour - 4

Activity 1 :Group discussion

Step 1- Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly – 1 hour

Step 2 - Perform Systemic analysis of research articles related to Paadanam or Related to above said drug

Step 3 - Each students should allotted with one paadanangal

Step 4 -student to prepare the review protocol include inclusion and exclusion criteria article to be included.

Step 5 - Student should relevant to the research article as per the protocol – 2 hour

Activity 2 : Lab report interpretation

Paadannal

Interpret and Report Results: 1 hour

Summarize the findings of the meta-analysis.

Discuss the implications of the results in the context of existing literature.

Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).

Follow reporting guidelines (PRISMA).
Student should publish one research article in any Indexed Journals.

Experiential-Learning 22.4 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics

Total Learning hour- 2

Activity 1 : Flipped class room

1. Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, Clearly state the research question, Protocol Development will given to student priorly .- 30 minutes
2. Perform Meta-analysis of research articles - 1 hour

Activity 2: Discussions :

interpret and Report Results: - 30 minutes

- a. Summarize the findings of the meta-analysis.
 - b. Discuss the implications of the results in the context of existing literature.
 - c. Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).
 - d. Follow reporting guidelines (PRISMA).
- d. Student should publish one research article in any Indexed Journals

Experiential-Learning 22.5 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics

Total Learning hour- 1

Activity 1 : Flipped class room

1. Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, Clearly state the research question, Protocol Development will given to student priorly .- 15 minutes
2. Perform Meta-analysis of research articles - 30 minutes

Activity 2: Discussions :

interpret and Report Results: - 15 minutes

- a. Summarize the findings of the meta-analysis.
- b. Discuss the implications of the results in the context of existing literature.

- c. Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).
- d. Follow reporting guidelines (PRISMA).
- d. Student should publish one research article in any Indexed Journals

Experiential-Learning 22.6 : Perform Meta-analysis - Arsenic and its compounds

Total Learning Hour - 4

Activity 1 - Group discussion

Step 1 -Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly – 1 hour

Step 2 -Perform Systemic analysis of research articles related to *Paadanam*

Step 3 - Each students should allotted with any one paadanam

Step 4 - student to prepare the review protocol include inclusion and exclusion criteria article to be included.

Step 5 - Student should relevant to the research article as per the protocol – 2 hour

Gowri paadanam, Vellai Paadanam, Thalagam, Manosilai, Kuthiraipal paadanam

Activity 2 : Lab report Interpret : 1 hour

- Summarize the findings of the meta-analysis.
- Discuss the implications of the results in the context of existing literature.
- Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).
- Follow reporting guidelines (PRISMA).
- Student should publish one research article in any Indexed Journals.

Experiential-Learning 22.7 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics

Total Learning hour- 1

Activity 1: Lecture with group discussion - 30 minutes

The teacher clearly describes the objectives of the practical session, Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparison of Siddha and modern drugs

Activity 2: Discussion

Sample preparation, procedure and interpret the results 30 minutes

Experiential-Learning 22.8 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics

Total Learning Hour- 3

Activity 1: Lecture with power point - 30 minutes

The teacher clearly describes the objectives of the practical session, Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparison of Siddha and modern drugs

Students shall be grouped into 2 Groups.

Activity 2: Demonstration

Step 1 : Each group of students Shall have to do Assignment on Analysis of Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetic of Raw Drugs Mentioned as Karangal in Kaarasaara Thurai and its applications in Siddha system of Medicine (Karasaram). -1 hour 30 minutes

Step 2 : Group discussion-30 minutes

Step 3 : Students should prepare and submit a detailed project report.- 30 minutes

Experiential-Learning 22.9 : Perform Meta-analysis - publish research article

Total Learning Hour - 5

Activity 1: Lecture with video clips

Step 1 : Briefly overview on Purpose of Meta-Analysis, Highlight the Importance of Rigor and Transparency, Literature Search and Study Selection, clearly state the research question, Protocol Development will give to student priorly. Before the practical session, video clips relevant to the practical session will be shown for 30 minutes.

Step 2: Perform Systemic analysis of research articles related to Kaarasaram

Step 3: Each students should allotted with any one of Kaarasaram

Step 4: student to prepare the review protocol including inclusion and exclusion criteria article to be included- 30 minutes

Activity 2: Discussion

Step 1: Student should relevant to the research article as per the protocol- 3 hour

Step 2: Interpret and Report Results: - 1 hour

Summarize the findings of the meta-analysis.

Discuss the implications of the results in the context of existing literature.

Acknowledge limitations of the meta-analysis (e.g., heterogeneity, publication bias).

Follow reporting guidelines (PRISMA).

Step 3: Student should publish one research article in any Indexed Journals

Experiential-Learning 22.10 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparison of Siddha and modern

drugs	
Toal Learning Hour- 1 Activity 1: Lecture with video clips The teacher clearly describes the objectives of the practical session, Biological roles, ADME, Mechanism of action activity on enzyme, Target organs,Toxicokinetics comparision of Siddha and modern drugs.Before the practical session, video clips will be shown for the following that test.	
Experiential-Learning 22.11 : Biological roles, ADME, Mechanism of action activity on enzyme, Target organs,Toxicokinetics comparision of Siddha and modern drugs	
Total Learning Hour- 2 Activity 1: Lecture with power point The teacher clearly describes the objectives of the practical session, Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparision of Siddha and modern drugs Students shall be grouped into 2 Groups - 10 minutes Activity 2: Demonstration Step 1 : Each group of students Shall have to do Assignment on Analysis of Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetic of Raw Drugs Mentioned as Saarangal in Kaarasaara Thurai and its applications in Siddha system of Medicine (Karasaram). -1 hour 30 minutes Step 2 :Group disscussion-10 minutes Step 3 :Students should prepare and submit a detailed project report- 10 minutes.	
Modular Assessment	
Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks 1. Objective Structured Practical Examination – 20 Marks Each student shall have to do Suthi Murai of any one Paadanam – 20 Marks Identification of Drug – 5 Marks Materials Required – 5 Marks Procedure and Result– 10 Marks 2. Multiple Long answer Questions – 20 Marks	4

Total of 2 Question Each Questions carries 10 Marks 3. Spotter Identification – 10 Marks There shall be total of 5 Spotters Each spotters contains 2 Marks 1 mark shall be awarded for Identification 1 mark shall be awarded for Description and therapeutic uses Or Any practical in converted form can be taken for assessment.(25 Marks) and Any of the experiential can be taken as an assessment.(25 Marks)	
Semester No : 6	
Module 23 : Uparasam and Navamanikal (Mineral substance and Gems) Jeeva Vaguppu – Part I (Drugs of Marine origin and Animal by products)	
Module Learning Objectives (At the end of the module, the students should be able to) Describe General characteristics, Therapeutic uses, Mechanism of action of <i>Uparasangal</i> and <i>Navamanikal Jeeva Porutkal</i> part I Conduct Various purification process and vaippu methods of <i>Uparasangal</i> and <i>Navamanikal, Jeeva Porutkal</i> part I Apply the Knowledge of Siddha Marunthiyal in Research to figure out the mechanism of action, pharmacokinetics of Siddha medications of <i>Uparasangal</i> and <i>Navamanikal, Jeeva Porutkal</i> part I.	
M 23 Unit 1 Uparasam Origin, Reason for synonyms if any, Organoleptic characters, Peculiar characteristics, Varieties if any, Scientific aspects of following 23.1.1 <i>Abragam</i> (Biotite Mica) 23.1.2 <i>Annabethi</i> (Green vitriol - Ferrous sulphate)	

- 23.1.3 *Karpoorasilasathu* (Asphalt)
 23.1.4 *Koomoothirasilasathu* (Gypsum)
 23.1.5 *Kalnaar* (Asbestos)
 23.1.6 *Karchunnambu*(Calcium carbonate)
 23.1.7 *Kadikaaram*(Nitrate of Silver)
 23.1.8 *Kavikal* (Red Ochre)
 23.1.9 *Thurusu* (Copper sulphate)
 23.1.10 *Nandukal* (Fossil Stone Crab)
 23.1.11 *Nimilai* (Chalcopyrite)
 23.1.12 *Palthutham* (Sulphate of Zinc)
 23.1.13 *Karudakal* (Magnesite)
 23.1.14 *Padigakal, Rasavarthakal, Karungal, Vellaikal, Kurunthakal, Sittakkal, Sukkangal, Sengal, Manjalkal, Maakgal, Mangishabedhi,*
 23.1.15 *Manal, Karumanal, Uvarman*

References: 27,111,138,152,205,206,234,276,278,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the Origin, Reason for Synonyms, Organoleptic characters, Peculiar characteristics, Varieties, scientific aspects of following <i>Abragam, Annabedhi, Karpoorasilasathu, Koomuthra silasathu, Kalnar, Karchunnam, Kadikaaram, Kavikal, Thurusu, Nandukal, Nimilai, Palthutham, Karudakkal</i> (Magnasite), <i>Padigakal, Rasavarthakal, Karungal, Vellaikal, Kurunthakal, Sittakkal, Sukkangal, Sengal, Manjalkal, Maakgal, Mangishabedhi, Manal, Karumanal, Uvarman</i>	2	Lecture	CC	Knows-how	L&GD, D L
CO1,CO2,CO6,CO7,CO8	Perform <i>Kadikaaram, Thurusu</i> and <i>Paalthutham</i> vaippu muraikal mentioned by various Siddhars	5	Practical Training 23.1	PSY-GUD	Shows-how	D, L&GD
CO1,CO2,CO6,CO7,CO8	Perform various purification Techniques - <i>Abragam, Karpoorasilasathu, Kalnar, Thurusu, Palthutham</i>	10	Practical Training 23.2	PSY-GUD	Shows-how	L&GD, D
CO1,CO2,CO6,CO7,CO8	Describe the Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1	Lecture	CAP	Knows-how	L&GD

CO1,CO2,CO6 ,CO7,CO8	Develope teaching ability	2	Experiential- Learning 23. 1	CAP	Does	D,TUT,L &PPT
CO1,CO2,CO6 ,CO7,CO8	Observe the traditional method of preparing <i>Karchunnambu</i>	2	Experiential- Learning 23. 2	PSY- GUD	Does	L_VC,DI S,D
CO1,CO2,CO6 ,CO7,CO8	Perform ore collection of <i>Abragam</i> and <i>Karchunam</i> , <i>Kavikal</i> , <i>Silasathu</i>	10	Experiential- Learning 23. 3	AFT- CHR	Does	L&GD,F V,PER
CO1,CO2,CO6 ,CO7,CO8	Perform purification of collected ores <i>Abragam</i> , <i>Karchunnam</i> , <i>Kavikal</i> , <i>Silasathu</i>	4	Experiential- Learning 23. 4	AFT- CHR	Does	W,DL,PE R,FV

M 23 Unit 2 Navamanigal (Gems)

Origin, Reason for synonyms if any, Organoleptic characters, Peculiar characteristics, Varieties if any, Scientific aspects of following 23.2.1 *Navamanigal* and its importance

23.2.1.1 *Muthu* (Pearl)

23.2.1.2 *Pavalam* (Red coral)

23.2.1.3 *Komethagam* (Hessonite)

23.2.1.4 *Neelamani* (Blue sapphire)

23.2.1.5 *Pushparagam* (Yellow sapphire)

23.2.1.6 *Maragatham* (Emerald)

23.2.1.7 *Manickkam* (Ruby)

23.2.1.8 *Vaituriyam* (Cats eye)

23.2.1.9 *Vairam* (Diamond)

23.2.2 Various purification Techniques

References: 2,26,111,138,152,205,206,234,276,278,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Define <i>Navamanikal</i> and its importance in Siddha system of medicine, historical importance of <i>Navamanikal</i> , Classification of <i>Navamanikal</i> , identification procedures and its relationship between planets, the suitable days, colours flowers, directions to worship the nine precious gems, the relationship between nine gems, planets, and human organs	1	Lecture	CC	Knows-how	L&PPT,PER
CO1,CO2,CO6,CO7,CO8	Describe the veruperyarkal (synonyms), zoological name, distribution, physical character, Pothugunam and sutthi, Geological characters of following - <i>Muthu</i> , <i>Pavalam</i> , <i>Komethagam</i> , <i>Neelamani</i> , <i>Pushparagam</i> , <i>Maragatham</i> , <i>Manickkam</i> , <i>Vaituriyam</i> , <i>Vairam</i>	1	Lecture	CC	Knows-how	DIS,L&GD,L&PPT
CO1,CO2,CO6,CO7,CO8	Perform various purification Techniques - <i>Muthu</i> , <i>Pavalam</i> ,	5	Practical Training 23.3	PSY-GUD	Shows-how	DL

M 23 Unit 3 Jeeva Vaguppu Part - I

23.3.1 Anthropods Describe Verupeyarkal (synonyms), zoological name, distribution, Pothugunam and sutthi(general characteristics and purification), Zoological aspects, Therapeutic uses, Name of the formulation pertaining to this drug, Mechanism of action (if available) of following

1. Karu vandu (Black Beetle – *Heteronychus arator*)
2. Kazhuthaivandu (Mupli beetle - *Luprops tristis*)
3. Naakara vandu (Wood-boring beetle - *Agrilus planipennis*)
4. Erivandu (Blister beetle - *Mylabris* sp.)
5. Minmini poochi (Firefly - *Photinus* sp.)

6. Indhirakoba Poochi (Red Velvet Mites - *Trombidium Grandissimum*) 23.3.2 Avians Zoological aspects , Therapeutic uses, Name of the formulation above said drug, Mechanism of action if available of following

1. Aaalkatti patchi (Red wattled lapwing - *Vanellus indicus*)
2. Kozhi (Domestic cock & hen - *Gallus domesticus*)
3. Kuruvi (House sparrow- *Passer domesticus*)
4. Mayil (Indian Peafowl - *Pavo cristatus*)

5. Vovaal (Indian fruit eating bat - *Pteropus giganteus*) 23.3.3 Reptiles Veruperyarkal (synonyms), zoological name, vaazhidam (habitat), Pothugunam (General characteristics), Varieties and sutthi (purification) of following, Clinical importance (if available)

1. Attai (Speckled leech - *Hirudo Medicinalis*)
2. Amai (Turtle - *Chelonia* sp.)
3. Oonan (Oriental Garden Lizard- *Calotes pethiyagodai*)
4. Udumbu (Common Indian monitor - *Varanus* sp.)
5. Nathai (Common garden Snail - Phylum: Mollusca)
6. Paambu (Snakes - Serpentes sub family)
7. Poonagam (Earthworm - *Lumbricus* sp.)
8. Erumbu (Ants - Formicidae)
9. Muthalai (Crocodile - *Crocodylus palustris*)
10. Mull eli (Thorny rat -n Hedgehog - *Erinaceus europaeus*) 23.3.4 Mammals

Verupearikal (synonyms), zoological name, distribution, Pothugunam (general characteristics), Current trends and recent research updates of following

1. Yaanai, Kuzhiyaanai, (Asian Elephant - *Elephas maximus*/ Antlion Insect- *Myrmeleon* sp)
2. Karadi (Sloth Bear- *Melursus ursinus*)
3. Maan (Deer - Cervidae)
4. Kaandamirukam (Indian rhinoceros - *Rhinoceros unicornis*)
5. Puli (Tiger - *Panthera tigris*)
6. Poonai (Asian palm civet - *Paradoxurus hermaphroditus*)
7. Muyal (Rabbit- *Oryctolagus cuniculus*)
8. Pandri, Pandri mul (Pig -*Sus domesticus*)

References: 116,138,152,205,232,276,278,280

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the verupearikal (synonyms), zoological name, distribution, Pothugunam and sutthi, zoological aspects, Therapeutic uses, Name of the formulations, Mechanism of action of following - <i>Karu vandu, Kazhuthaivandu, Naakara vandu, Erivandu, Minimi poochi, Indhirakoba poochi</i>	1	Lecture	CC	Knows-how	D,DIS,L &GD
CO1,CO2,CO6,CO7,CO8	Describe the verupearikal (synonyms), zoological name, distribution, Pothugunam and sutthi Therapeutic uses, Name of the formulations, Mechanism of action of following <i>Aalkalti patchi, Kozhi, Kuruvi, mayil, Vovaal</i> , Zoological aspects ,	1	Lecture	CC	Knows-how	D,L&PPT

CO1,CO2,CO6 ,CO7,CO8	Describe the veruperyarkal (synonyms), zoological name,vaazhidam, Pothugunam, Varities and suththi, zoological aspects ,Therapeutic uses, Name of the formulation of following - <i>Attai, Amai, Oonan, Udumbu, Nathai, Paambu, Poonagam, Erumbu, Muthalai, Mulelli</i>	1	Lecture	CC	Knows-how	L&PPT ,D
CO1,CO2,CO6 ,CO7,CO8	Discuss the clinical importance of leech therapy (hirudotherapy)	1	Lecture	CK	Knows-how	L_VC,D
CO1,CO2,CO6	Describe the veruperyarkal (synonyms), zoological name, distribution, Pothugunam, zoological aspects , Therapeutic uses, Name of the formulation of following - <i>Yaanai, Kuzhiyaanai, Karadi, Maan, Kaaandamirukam, Puli, Poonai, Muyal, Pandri, Pandri mul</i>	1	Lecture	CK	Knows-how	D,BL
CO1,CO2,CO6 ,CO7,CO8	Discuss about Current trends and recent research updates	8	Experiential-Learning 23.5	AFT-CHR	Does	DIS,PER,PrBL

Practical Training Activity

Practical Training 23.1 : Vaippu muraikal - *Kadikaaram, Thurusu and Paalthutham*

Total learning hour: 5

Activity 1 - Practical - Demonstration

Step 1- The teacher clearly explains the objectives of the practical session, such as Identification of raw drug, Vaippu muraikal & its importance, performing assessments, and exploring management strategies- 30 minutes

Step 2: Group Formation:

Students shall be grouped into two (Maximum 3)

Step 3 - Students of each group shall Identify the Required Raw Drugs.

Required materials for the practical will be issued to the students.

Step 4 - Conduct the Experiment 2 hours for each raw drug(4 hours)

Students of each group Shall have to perform any two of the Vaippu Muraikal Mentioned in the Siddha Texts for the following Raw Drugs

- *Kaadikkaaram,*

- *Thurusu,*
- *Paalthutham*

Step 5 - Group discussions will be conducted based on the experiments. -10 minutes.

Step 6: Personalised feedback will be collected. Q/A sessions will be conducted at the end of the practical hours -10 Minutes

Step 7: Record the data and document it submits it in detailed report. - 10 minutes

Practical Training 23.2 : Various purification Techniques - *Abragam, , Karpoorasilasathu, Kalnar, Thurusu, Palthutham*

Total learning hour: 10

Activity 1 - Practical - Demonstration Lab

Step 1- The teacher clearly describes the objectives of the practical session, such as Identification of raw drug, purification techniques and various other purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, performing assessments, and exploring management strategies- 30 minutes

Step 2 - Students Shall be Grouped into 2 Group

Step 3 - Students of each group shall Identify the Required Raw Drugs.

Step 4 - Students of each group Shall have to perform any two Purification Technique Mentioned in the Siddha Texts for each raw drug – 9 Hour

- *Abragam*
- *Karpoorasilasathu,*
- *Kalnar*
- *Thurusu,*
- *Palthutham*

Step 5 - Student should have to demonstrate the procedure. – 5 minutes

Step 6 - Group discussions will be conducted based on that experiments and further various purification methods mentioned in siddha literature. Will be discussed -15 minutes.

Step 7 -Personalised feedback will be collected. Viva-voce sessions will be conducted at the end of the practical hours -5 Minutes

Step 8 - Record the data and document it. - 5 minutes

Practical Training 23.3 : Various purification Techniques - *Muthu, Pavalam,*

Total learning hour: 5

Activity - Practical - Deonstration Lab

Step 1- The teacher clearly describes the objectives of the practical session, such as Identification of raw drug, purification techniques and other various purification techniques, and importance of purification, Interpretation of before and after purification of raw drugs, performing assessments, and exploring management strategies- 30 minutes

Step 2 - Students Shall be Grouped into 2 Groups

Grouped Students should perform the procedure at Gunapadam Marunthiyal Laboratory

Step 3 -Students of each group shall Identify the Required Raw Drugs.

Step 4 - Students of each group instructed to perform any two Purification Technique Mentioned in the Siddha Texts for each raw drug – 2 Hours each(4 hours)

- Muthu
- Pavalam

Step 5 - Student have to summarise the procedure. – 5 minutes

Step 6 - Group discussions will be conducted based on that experiments and further various purification methods mentioned in siddha literature will be discussed -15 minutes.

Step 7 - Personalised feedback will be collected. Viva-voce sessions - 10 minutes

Experiential learning Activity

Experiential-Learning 23.1 : Assessment of teaching ability

Total Learning hour -1

1. Students should take classes for Undergraduate students in their Class room and they will substantiate their teaching ability- 45 minutes
2. Small group discussion and interaction session- 15 minutes.
3. Faculty should observe and asses the Teaching ability of the student and give remarks about their class and instruct techniques to improve their teaching skill.

Experiential-Learning 23.2 : Traditional preparation method - *Karchunnambu*

Total Learning hour- 2

Activity 1 - Experiential Learning - Demonstration

1. A brief overview of *Karchunnambu*, how it can be obtained through natural sources as well as artificially should be taught to the students priorly (shows videos/ direct visit)- 15 minutes
2. Group of 10 students shall visit places where *Karchunambu* is prepared traditionally students should observe the method of preparation of *Karchunnambu*- 1 hour
3. A small insightful group discussion between students and faculties- 30 minutes
4. The students will be asked to submit detailed report on preparation of *Karchunnambu* post field visit. - 15 minutes

Experiential-Learning 23.3 : Geological ore collection of *Abragam* and *Karchunam*, *Kavikal*, *Silasathu*

Total Learning hour - 10

Activity 1 - Field Visit

1. Faculty will give a brief overview about the *Abragam*, *Karchunam*, *Kavikal*, *Silasathu* ores, their nature, geological formations and mineral deposits, physical and chemical properties, purification process, medicinal properties, and about their usage prior to the field visit. - 1 hour
2. Students will be organized into small groups – 2 to 5 members and will visit Various places/Mineral mines for collection of *Abragam*, *Kavikal*, *Silasathu* ores- 7 hours
3. Safety guidelines for field collection will be given.
4. They will be asked to collect 3 different ores.
5. Experts from the field of Minerology will guide the students to ascribe skills in methods of ore collection.
6. Each student will be asked to collect the ore individually at adequate quantity required for examination and analysis.

Activity 2 - Group discussion - 30 minutes

Activity 3 - Presentation - 1 hour

Activity 4- student should submit the report of post field visit-30 minutes

Experiential-Learning 23.4 : Purification of collected ores *Abragam*, *Karchunnam*, *Kavikal*, *Silasathu*

Total Learning hour - 4

Activity 1 - Field Visit

1. Faculty will give a brief overview about the *Abragam*, *Karchunam*, ores, their nature, geological formations and mineral deposits, physical and chemical properties, purification process, medicinal properties, and about their usage prior to the field visit. - 30 Minutes
2. Students will be organized into small groups – 2 to 5 members and will visit Various places/Mineral mines for collection of *Abragam*, *Karchunam*- 2 hours 30 minutes
3. Safety guidelines for field collection will be given.
4. They will be asked to collect 3 different ores.
5. Experts from the field of Minerology will guide the students to ascribe skills in methods of ore collection.

6. Each student will be asked to collect the ore individually at adequate quantity required for examination and analysis.

Activity 2 - Group discussion - 30 minutes

Activity 3 - Presentation - 15 minutes hour

Activity 4- student should submit the report of post field vist- 15 minutes

Experiential-Learning 23.5 : Current trends and recent research updates

Total Learning hour -8

Activity 1 : Group Discussion - 1 hour

Overview of recent research trends about Uparasam and Navamanigal such as Nano material and their application, rare earth elements and their importance, Sustainable mining and recycling of metals, Laboratory reports- 1 hour

Activity 2 : Project Based Learning - 4 Hour

Students shall have to do Project on Current trends and recent research updates- metals/minerals/ Navamanigal (any one) - 4 hour

Activity 3: Group Discussion - 1 Hour

Group discussions: small group discussion to analyse the results of experiments and discuss the implications of recent Research findings -1 hour

Activity 4 : Presentation - 1 Hour

Presentation: Research projects on specific minerals/metals/ gems/ focusing on their properties, applications, and recent research updates-1 hour

Activity 5: Report: detail report should be submitted. - 1 hour

Modular Assessment

Assessment method

Hour

Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C.

Choose any of the below assessment for 50 marks.

Objective Structured Practical Examination – 25 Marks

In vitro Muscle Contraction and relaxation studies – 10 marks

Vaippu Muraigal – 10 Marks

Determination of PH – 5 Marks

Multiple choice questions – 20 Marks

20 Questions

Each Questions carries 1 mark

4

Spotter Identification – 5 Marks

There shall be 5 Spotters

Each spotter carries 1 Mark

Or

Any practical in converted form can be taken for assessment.(25 Marks)

and

Any of the experiential can be taken as an assessment.(25 Marks)

Module 24 : Jeeva Vaguppu Part - II (Drugs of Marine Origin and Animal by Products)

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe Taxonomy of Animal and Marine Biology

Conduct chemical analysis of By-Products in order to validate Quality.

Apply the Knowledge of Marine Medicinal Chemistry Clinically and also in Research for newer drug Discovery in Siddha Medicine

M 24 Unit 1 Introduction to Biology, Nomenclature, Taxonomy

24.1.1 Animal kingdom

24.1.2 Marine kingdom - Molluscs, Fishes

References: 68,250

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6 ,CO7,CO8	Describe Introduction to biology, nomenclature, taxonomy of Animal kingdom and Marine kingdom	1	Lecture	CC	Knows-how	L&GD,L &PPT

						,L_VC
M 24 Unit 2 Marine Medicinal Chemistry 24.2.1 Nutritional aspects of various types of fishes, Health effects of fish proteins and other Marines products 24.2.2 Role of Fish Skin in Wound Healing (Burns, Diabetic Ulcers, and Non-Healing Ulcers) 24.2.3 Marine peptide and proteins (Lectin, collagen, elastin, chitin, chaetocin, glucosamine, chondroitin sulfates, and antimicrobial peptide present in molluscs) 24.2.4 Marine sources of Vitamins and minerals in health References: 55,125						
3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the Nutritional aspects of various types of fishes, Health effects of fish proteins and other Marines products. Role of fish Skin in treatment of wound healing in burns, Diabetic ulcer and other non-healing ulcers	1	Lecture	AFT-VAL	Knows-how	RLE,L_VC,PrBL
CO1,CO2,CO6,CO7,CO8	Describe the Marine peptide and proteins – Lectin, collagen, elastin, Kitin, Chetocin, glucosamine, chondroitin sulfates and antimicrobial peptide present in molluscs	1	Lecture	CAP	Knows-how	L&PPT, L&GD,DIS,PrBL
CO1,CO2,CO6,CO7,CO8	Describe Marine sources of Vitamins and Minerals and their significance in health	1	Lecture	CC	Knows-how	TBL,DIS,PrBL
M 24 Unit 3 Evaluation And Analysis Of Animal By-Products 24.3.1 Adulteration in animal bi - products - Analysis of Milk 24.3.1.1 Detection of adulteration in milk 24.3.1.2 Detection of foreign fat in milk 24.3.1.3 Detection of formalin in milk 24.3.2 Adulteration in animal by products - Analysis of Curd 24.3.2.1 Presence of starch 24.3.3 Adulteration in animal by products - Analysis of Butter & Ghee 24.3.3.1 Test for detection of Vanaspati in ghee 24.3.3.2 Test for detection of mineral oil in ghee 24.3.3.3 Perform Analysis of Honey, bees wax 24.3.4 Adulteration in animal by products - Analysis of Honey						

24.3.4.1 Determination of total reducing sugar sucrose and fructose- glucose ratio
 24.3.4.2 Determination of pollens and plant element in honey 24.3.5. Adulteration in animal by products - Analysis of Bees wax
 24.3.5.1 Determination of melting points
 24.3.5.2 Determination of carnauba wax
 24.3.5.3 Determination of paraffin in other wax 24.3.6. Methods of analysis of Meat & fish products
 24.3.6.1 Govt food analysis laboratory / Central Food technological research institute

References: 56,57,146

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe Adulteration in animal By-products used in Siddha system of Medicine	1	Lecture	CAP	Knows-how	DIS,L&G D,PBL
CO1,CO2,CO6,CO7,CO8	Perform following Analysis of Milk Milk a. Detection of adulteration in milk b. Detection of foreign fat in milk c. Detection of formalin in milk d.Detection of water content in milk	9	Practical Training 24.1	PSY-GUD	Shows-how	
CO1,CO2,CO6,CO7,CO8	Perform Analysis of Curd for Presence of Starch	2	Practical Training 24.2	PSY-GUD	Shows-how	
CO1,CO2,CO6,CO7,CO8	Perform Following Tests for Evaluating Adulteration in Ghee a. Test for detection of Vanaspati in ghee b. Test for detection of mineral oil in ghee	4	Practical Training 24.3	PSY-GUD	Shows-how	
CO1,CO2,CO6,CO7,CO8	Perform Analysis of Honey, bees wax Honey a. Determination of total reducing sugar sucrose and fructose- glucose ratio b. Determination of pollens and Foreign matters in honey Bees wax	5	Practical Training 24.4	PSY-GUD	Shows-how	

	a. Determination of melting points b. Determination of carnauba wax c. Determination of paraffin in other wax					
CO1,CO2,CO6,CO7,CO8	Discuss about health impacts of Adulteration in Edible Animal By-Products in Siddha formulation	6	Experiential-Learning 24.1	AFT-VAL	Does	PrBL

M 24 Unit 4 Jeeva vaguppu part – II

24.4.1 Aquatic Animals and Animal - Products

Verupeyarkal(synonyms), zoological name, distribution, Pothugunam(general characteristics), Zoological aspects ,Therapeutic uses, Name of the formulation pertaining to this drug, Current trends and recent research updates in drugs of animal and marine origin(Mechanism of action if available) of following 24.4.1.1

Aquatic Animals

1. Aamai (Turtle - *Chelonia* sp)
2. Sura (Milk Shark - *Carcharhinus hemiodon*)
3. Nandu (Crab - Indian rice field crab - *Oziotelphusa*)

24.4.1.2 Animal By - Products

1. *Irakugal* (Feathers of birds)
2. *Elumbugal* (Bones)
3. *Kasthuri* (Musk - *Moschus moschiferus*)
4. *Kombugal* (Horns)
5. *Kilinjai* (Common oyster shell)
6. *Kulambugal* (Hoofs)
7. *Kulavikoodu* (Wasp nest -*Vespula* sp.)
8. *Kombaraku* (Lac- *Laccifer Lacca*)
9. *Korosamai* (Purified ox bile/ ox gall - *Felbovinum purifactum*)
10. *Sangu* (Conch shell - *Turbinella rapa*)
11. *Saanam* (Dung)
12. *Siruneer* (Urine)
13. *Thantham* (Teeth)

14. *Thaen* (Honey)
15. *Nari Ettcham* (Fox - *Vulpes* sp)
16. *Palagarai* (Cowry - *Cypraea moneta* Linn)
17. *Pambusattai* (Snake skin- *Naja naja*)
18. *Palum Pal Porutkalum* (Milk & Milk Products)
19. *Pitchi* (Bile)
20. *Pura Ettcham* (Pigeon excrement)
21. *Punugu* (Civet Cat - *Viverra civetta*)
22. *Musuru Muttai* (Egg of *Formica Smaragdina*)
23. *Muttai Oodu* (Egg Shell)
24. *Muthuchippi* (Pearl Oyster Shell - *Mytilus margaritiferus*)
25. *Mezhugu* (Wax)
26. *Meen Elumbu* (Fish Bone)
27. *Viraal Meen Thalai Kal* (Snakehead Murrel Fish- *Channa striata*)
28. *Putransooru* (Termite mound on Rice fields - *Isoptera*)
29. *Silanthivalai Nool* (Web of cobweb spiders (family *Theridiidae*))
30. *Kadal Nurai* (Sea froth)

References: 138,232,234

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6,CO7,CO8	Describe the veruperyarkal (synonyms),zoological name, distribution, Pothugunam, zoological aspects , Therapeutic uses, Name of the formulation of following - <i>Aamai</i> , <i>Sura</i> , <i>Nandu</i> , <i>Irakukal</i> , <i>Elumbukal</i> , <i>Kombukal</i> , <i>Kilinjai</i> , <i>Kulambukal</i> , <i>Kulavikoond</i>	1	Lecture	CC	Knows-how	D,L&PPT
CO1,CO2,CO6,CO7,CO8	Describe the veruperyarkal (synonyms), zoological name, distribution, Pothugunam, Therapeutic action, medicinal uses of following - <i>Kombaragu</i> , <i>Sangu</i> , <i>Saanam</i> , <i>Siruneer</i> , <i>Thantham</i> , <i>Thean</i> , <i>Narietcham</i> , <i>Palakarai</i> , <i>Pambusattai</i> , <i>Pitchi</i> , <i>Pura ettcham</i> , <i>Poonagam</i> , <i>Punugu</i> , <i>Musuru muttai</i> , <i>Muttai odu</i> , <i>Muthuchippi</i>	1	Lecture	CC	Knows-how	DIS,L&PPT
CO1,CO2,CO6,CO7,CO8	Describe the veruperyarkal (synonyms),zoological name, distribution, Pothugunam, Therapeutic action, medicinal uses of following - <i>Mezhugu</i> , <i>Meen elumbu</i> , <i>Viraal meen</i>	1	Lecture	CC	Knows-how	DL,L&GD

	<i>thalai kal, Putran soru, Silanthivalai nool, Kadal nurai.</i>					
CO1,CO2,CO6 ,CO7	Describe the <i>Paalum paal porutkalum</i> in Siddha aspects, bioactive compounds in dairy products and its therapeutic significance, role in nutrition and health.	1	Lecture	CC	Knows-how	DL,BL
CO1,CO2,CO7 ,CO8	Describe the <i>veruperyarkal</i> (synonyms), zoological name, distribution, <i>pothugunam</i> , and <i>vaippu murai</i> of following - <i>Kasthuri, Korosani</i> .	1	Lecture	CC	Knows-how	L&PPT ,DL
CO1,CO2,CO6 ,CO7,CO8	Observe and document Methods of analysis of Meat & fish products Govt food analysis laboratory / Central Food technological research institute	10	Experiential-Learning 24.2	CS	Does	L&GD,F V,DL,DIS
CO1,CO2,CO6 ,CO7,CO8	Visit for Central Salt and Marine Chemical Research Institute	10	Experiential-Learning 24.3	AFT-SET	Does	FV

Practical Training Activity

Practical Training 24.1 : Analysis of Milk

Total Learning hours - 9 hours

Activity 1 - Group discussion

Step 1: The teacher clearly outlines the objectives of the practical session, such as Identification of sample, Methods to identify the adulterated one, methods of packing the sample before lab - 1 hour

Step 2: Group Formation:

Students shall be grouped into two or three (Minimum 2, Maximum 4)

Step 3: Required items for the practical's shall be issued to the students.

Step 4: Sample preparation – 1 hour

Activity 2 - Practical - Demonstration Lab : 5 hours

Student shall have to Perform Following tests for Milk

- Detection of Adulteration in Milk
- Detection of Foreign Fat in Milk
- Detection of formalin in milk
- Detection of water content in milk

Step 6: Students will be asked to summarise the experiment.

Small group discussions will be conducted based on the experiment, and further advanced techniques for these test will be discussed - 1 hour

Step 7: Personalised feedback will be collected. Viva voce sessions will be conducted at the end of the practical hours.-30 Minutes

Step 8: Student shall prepare a authentication report of curd-30 minutes.

Practical Training 24.2 : Analysis of Curd

Total learning hour: 2

Activity 1 - Practical - Demonstration Lab - 2 hours

Step 1- The teacher clearly outlines the objectives of the practical session, such as Identification of sample, Methods to identify the adulterated one, methods of packing the sample before lab, Precaution Methods -30 minutes

Step 2: Group Formation:

Students shall be grouped into two or three (Minimum 2, Maximum 4)

Step 3 - Required items for the practicals shall be issued to the students.

Step 4 - Sample preparation – 10 minutes

Step 5 - Conduct the Experiment: 30 minutes

Student shall have to Conduct Following tests to evaluate the Purity of Curd

a. Test for Presence of Starch,Fat

Step 6: Students will be asked to summarise the experiment.

Small group discussions will be conducted based on the experiment, and further advanced techniques for these test will be discussed . -20 minutes.

Step 7: Personalised feedback will be collected. Viva voce sessions will be conducted at the end of the practical hours.-20 Minutes

Step 8: Student shall prepare a authentication report of curd. - 10 minutes.

Practical Training 24.3 : Analysis of Ghee for Purity

Total learning hour: 4

Activity 1 -Discussion

Step 1- The teacher clearly outlines the objectives of the practical session, such as Identification of sample, Methods to identifying the adulterated one, methods of

packing the sample before lab -30mins

Step 2: Group Formation:

Students shall be grouped into two or three (Minimum 2, Maximum 4)

Step 3 - Required materials for the practicals shall be issued to the students.

Step 4 - Sample preparation – 30 minutes

Activity 2 - Practical - Demonstration Lab

Step 1 -Conduct the Experiment: 2.30 hours

There shall be 1 hour 15 Minutes for each test

Test for Detection of Vanaspati in Ghee

Test for Detection of Mineral oil in Ghee

Step 2 - Students will be asked to summarise the experiment.

Step 3 - Small group discussions will be conducted based on the experiment, and further advanced techniques for these test will be discussed . -10 minutes.

Step 4- Personalised feedback will be collected. Viva voce sessions will be conducted at the end of the practical hours.-10 Minutes

Step 5 - Record the data and document it in record notebook. - 10 minutes.

Practical Training 24.4 : Analysis of Honey and Bees Wax

Total learning hour: 5

Activity 1 - Practical - Demonstration Lab

Step 1

The teacher clearly explains the objectives of the practical session, such as Identification of sample Methods to identify the adulterated one, methods of packing the sample before lab, Precaution Methods -30 hour

Step 2: Group Formation

a. Students shall be grouped into two or three (Minimum 2, Maximum 4)

Step 2 - Required materials for the practicals shall be issued to the students.

Step 3 - Sample preparation – 1hour (for 3 samples)

Step 4 - Conduct the Experiment: 3 hours
There shall be 1 hour allocation for Honey

1. Determination of Reducing Sugar, Sucrose, Fructose – Glucose ratio
2. Determination of Pollens and Foreign matters in Honey

There shall be 2 hour allocation for Beewax

1. Determination of Melting Point
2. Determination Carnauba wax
3. Determination of Paraffin and other wax

Step 5: Students will be asked to summarise the procedure

Small group discussions will be conducted based on that, and further discussion will be on various samples used for these test. -10 minutes.

Step 6: Personalised feedback will be collected.

Step 7: Record the data and document it in record notebook. - 20 minutes

Experiential learning Activity

Experiential-Learning 24.1 : Adulteration in edible Animal By-Products

Total Learning hour-6

Activity 1 - Experiential Learning - Project Based Learning

1. An overview about Adulteration in edible Animal By-Products should be shared with students. - 1 hour
2. A small group should be formed. (2 Students per Group)
3. Each Group shall do a detailed literature review about Adulteration in animal by-products and its impact on health.- 3 hour
4. Each group students shall prepare and submit detailed Project report - 1 hour
5. Each student shall have to do Presentation in their class about their Project report - 1 hour

Experiential-Learning 24.2 : Field visit - Food analysis laboratory

Total Learning hour -10

Activity 1 - Experiential Learning - Field Visit Overview on Food analysis laboratory should be given to the students priorly.- 1 hour 2. Students will be asked to maintain the safety protocols inside the laboratory.- 30 minutes 3. A small group should be formed. (2 Students per Group) - 30 minutes 4. Each group of students should observe Methods of analysis of Meat & fish products of Govt food analysis laboratory / Central Food technological research institute.- 5 hours 5. A small insightful group discussion between students and faculties. -1 hour 6. Students should prepare and submit a detailed field visit report. - 1 hour 7. presentation - post field visit Report - 1hour	
Experiential-Learning 24.3 : Field visit -Central Salt and Marine Chemical Research Institute	
Total Learning hour- 10 Activity 1 - Experiential Learning - Field Visit 1. Overview of Marine products will be provided along with their importance- 1 hour 2. Safety protocols should be followed.- 30 minutes 3.Students will be organized into small groups – 2 to 5 members. visit central salt and Marine chemical research institute - 3 hours 4. Student should observe the processing of marine chemical and salts and will be asked to interpret its health impacts.- 4 hour 5. A small insightful group discussion between students and faculties. - 30 minutes 6. Students should submit a detailed project report on “The health impact on marine chemical and salts”. - 1 hour	
Modular Assessment	
Assessment method	Hour
Instructions - Conduct a structured Modular assessment. Assessment will be for 50 marks. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Choose any of the below assessment for 50 marks 1.Objective Structured Practical Examination – 20 Marks Analysis of Milk/Ghee/Butter/Curd – 10 Marks Analysis of Honey/ Wax – 10 Marks 2. Multiple Choice Questions – 20 Marks Total of 20 Questions	4

Each question carries 1 Mark

Questions Should be from Unit 1 and Unit 2

3. Comprehensive Essay Writing – 10 marks

Each student shall be allotted with one Jeeva porul

Each student should write and submit essay about the allotted Jeeva porul

The Essay shall consists of Zoological aspects, description, properties and therapeutic uses in Siddha aspects, Scientific advances – from review of articles.

Or

Any practical in converted form can be taken for assessment.(25 Marks)

and

Any of the experiential can be taken as an assessment.(25 Marks)

Paper No : 4 Essentials of Pharmacology						
Semester No : 3						
Module 25 : General Pharmacology						
Module Learning Objectives (At the end of the module, the students should be able to) Describe: Sources of drugs, various routes of drug administration, pharmacokinetics and pharmacodynamics Conduct: Estimation of Pharmacokinetic parameters, ADR reporting Identify: Drug receptor transduction mechanism, various dosage forms including novel drug delivery						
M 25 Unit 1 Introduction to Pharmacology 25.1.1 Definition 25.1.2 Source of drugs 25.1.3 Drug nomenclature 25.1.4 Dosage forms of drugs 25.1.5 Routes of drug administration 25.1.6 Novel drug delivery systems References: 29,189,236						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe source of drugs, dosage forms of drugs, routes of drug administration and novel drug delivery systems	1	Lecture	CC	Knows-how	L_VC,SI M,L&PP T
CO4	Discuss and differentiate various novel drug delivery dosage forms	1	Practical Training 25.1	PSY-GUD	Shows-how	D-M
M 25 Unit 2 Pharmacokinetics						

25.2.1. Membrane transport 25.2.2. Absorption 25.2.3. Distribution 25.2.4. Metabolism and Excretion of drugs 25.2.5. Kinetics of elimination 25.2.6. Bioavailability/Bioequivalence (BA/BE) studies

References: 29,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the principles of pharmacokinetics of drugs and factors affecting Pharmacokinetics	4	Lecture	CC	Knows-how	L&PPT, L_VC
CO4	Analyse experimental and clinical data related Pharmacokinetics of drug	3	Practical Training 25.2	PSY-GUD	Shows-how	D,SIM,PBL
CO4	Describe Strategies and Perspectives of Pharmacokinetic Profiling of AYUSH Drugs using case studies	6	Experiential-Learning 25.1	PSY-GUD	Does	PAL,ML,LS,TBL

M 25 Unit 3 Pharmacodynamics

25.3.1. Principles of drug action 25.3.2. Mechanism of drug action 25.3.3. Receptor Pharmacology 25.3.4. Dose-response relationship 25.3.5. Drug synergism and antagonism

References: 29,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the principles of pharmacodynamics and factors that modify drug action	2	Lecture	CC	Knows-how	L&PPT, L_VC
CO4	Document various possible mechanisms of actions of drug	8	Practical Training 25.3	PSY-GUD	Does	L&GD
CO4	Illustrate the combined effects of drugs-synergism, antagonism, potentiation and efficacy	8	Practical Training 25.4	CC	Shows-how	SIM,L&GD

CO4	Conduct ADR analysis of Siddha formulations and report as per guidelines	10	Experiential-Learning 25.2	PSY-GUD	Does	IBL,DIS,CBL,LRI
M 25 Unit 4 Adverse drug effects 25.4.1.Drug toxicity 25.4.2. Hypersensitivity 25.4.3. Idiosyncrasy 25.4.4. Tolerance 25.4.5. Dependence 25.4.6. Teratogenicity 25.4.7. Mutagenicity and Carcinogenicity 25.4.8. Pharmacovigilance References: 29,40,41,189,236						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe adverse drug effects including drug toxicity, hypersensitivity, idiosyncrasy, tolerance, dependence, teratogenicity, mutagenicity and carcinogenicity	3	Lecture	CC	Knows-how	L&PPT ,L_VC
CO4	Conduct Adverse Drug Reaction (ADR) analysis of Siddha formulations and report as per guidelines	10	Experiential-Learning 25.3	PSY-GUD	Shows-how	CBL,PAL ,IBL,LRI, DIS
Practical Training Activity						
Practical Training 25.1 : Identification of Novel drug delivery dosage forms						
Total hour: 1 1. Various novel drug delivery dosage form displays will be arranged. 2. Students should examine displays showcasing novel drug delivery systems- 15 min. 3. They have to record key information about each system, including:Technology type (e.g., nanoparticles, microneedles) Mechanism of action, Targeted diseases or applications, Advantages over existing systems-15 min 4. Compile Findings and create a report summarizing the identified novel drug delivery systems, including strengths and potential challenges.- Half an hour						
Practical Training 25.2 : Experimental and clinical data related Pharmacokinetics of drugs using software						
Total Hours: 3						

- I. Data collection and extraction in a suitable file format-1 hr
- II. Analysis of parameters in the software-1 hr,
- III. Estimation of kinetic parameters, reporting and documentation- 1 hr
 1. Students should launch the software program
 2. Gather concentration vs. time data
 2. Organize the data in a suitable format, typically as two columns: one for time and one for concentration.
 3. Clean the data to remove outliers or errors.
 4. Decide on the model (e.g., one-compartment, two-compartment, etc.).
 5. Choose appropriate software for analysis.
 6. Input the concentration vs. time data into the chosen software. Follow the software's guidelines for formatting.
 7. After fitting, the software will provide estimates for pharmacokinetic parameters such as: C_0 (initial concentration), k (elimination rate constant), V_d (volume of distribution), CL (clearance), $t_{1/2}$ (half-life).
 8. Report Results

Practical Training 25.3 : Identification of transduction mechanism of receptors using models (Physical/digital)

Total hours: 8

Video clips/Charts will be given to students. Students will be instructed for the following:

1. Identify the mechanism by which particular drug acts as per the charts or visuals- 1hr
2. Explain the transduction mechanism involved in it- and give the examples of drugs acting through this particular mechanism--3 hrs
4. Make a report on various transduction mechanisms pathways and submit-4 hrs

Practical Training 25.4 : 1.Dose response curve (DRC) plotting for pD_2 value for acetylcholine on frog rectus abdominis muscle using simulated experiments using Ex pharm software.

2. Identification of synergistic and antagonistic actions of drugs using charts

Total hours: 8

1. DRC Plotting-4 hrs
 - 1.1. Students should select suitable Experimental Model: in software.
 - 1.2. Acetylcholine has to be used to establish a concentration range (e.g., 10 nM to 100 μ M).

- 1.3. Responses of muscle contraction has to be observed and data should be analysed to generate Dose-Response Curve:
- 1.4. Determine pD2 Value: Calculate EC50 and then pD2 using the formula:
- 1.5. Record Results: Document the curve, EC50, and pD2 values; export data for reports.
- 1.6. Write a Report: Summarize the procedure, results, and conclusions.
2. Review and Interpret Data: Analyse the dose-response curve and discuss factors affecting results, like receptor sensitivity and desensitization- 2 hrs.
3. Identification of synergism and antagonism of drugs using charts and reporting the various types of antagonism with examples-2 hrs

Experiential learning Activity

Experiential-Learning 25.1 : Seminar presentation on Strategies and Perspectives of Pharmacokinetic Profiling of AYUSH Drugs using case studies

Total hours: 6

Literature Collection- 3 hrs

Power point preparation- 2 hrs

Presentation of seminar and interaction-1 hr

Students will be instructed to prepare Seminar Outline including the following details:

1. Introduction, Definition of Ayush (Ayurveda, Yoga, Unani, Siddha, Homeopathy)., Explain the significance of pharmacokinetics, Overview of Pharmacokinetic Profiling, Discuss ADME (Absorption, Distribution, Metabolism, Excretion):
2. Highlight its importance in drug development.
3. Strategies for Pharmacokinetic Profiling
4. In Vitro Studies: Use of models like Caco-2 for absorption studies. (Cite relevant articles)
5. In Vivo Studies: Animal studies for bioavailability and distribution. (Cite relevant articles)
6. Computational Approaches: Modeling and simulation techniques. (Cite relevant articles)
7. Clinical Trials: Importance of human studies. (Cite relevant articles)
8. Perspectives on Challenges and Opportunities:
9. Discuss regulatory challenges and research gaps.
10. Explore integration with modern medicine.
11. Case Studies : Present successful pharmacokinetic profiling examples. (Cite relevant articles)
12. Conclusion: Summarize key points and emphasize ongoing research needs.

Experiential-Learning 25.2 : Group Discussion on Pharmacovigilance Center functions

Total hours: 10

Group the students and instruct them to discuss the following:

1. Introduction to pharmacovigilance, regulations, and the roles of pharmacovigilance centers-1 hr
2. Overview of Adverse Drug Reactions (ADR), their types, and ADR reporting systems- 2 hrs
3. Methods of data collection, database management, and data validation- 2 hrs
4. Signal detection, risk assessment, and causality evaluation- 2 hrs
5. Regulatory reporting requirements and pharmacovigilance in clinical trials and post-marketing surveillance- 1 hr
6. Practical session on ADR reporting- 2 hrs.

Experiential-Learning 25.3 : ADR analysis of Siddha formulations

Total hours-10

Students will be divided into small groups They have to perform the following activities.

1. Gather patient details, drug information (formulation, dosage), ADR details, concomitant medications, and relevant medical reports-4 hrs
2. Recognise an adverse drug reaction (ADR) in the given case - 1 hr
3. Fill the ADR reporting form (CDSCO form)- 2 hrs
4. Explain the management of the ADR and methods to prevent the occurrence of the ADR - 2 hrs
6. Report the ADR to the pharmacovigilance centre and describe the Importance of reporting ADRs- 1 hr

Modular Assessment**Assessment method**

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessment for 50 marks.
A.Theory structured Viva- (20 Marks)

Hour

4

1. Prepare a 10 viva questions including all the units
 2. Answer key- Prepare the key points that need to be covered and marks to be allocated to different sections.
 3. Example - Question: What are the advantages of sublingual route of drug administration?
 4. Answer Key: Advantages (1M) and example (1M): Advantages-rapid onset of action, avoidance of first-pass metabolism, convenience, and improved bioavailability for specific drugs.
and example-Nitroglycerin for Angina pectoris.
- B. Application-Based/Case Study Question- 10 marks
1. Instruct the students to discuss the cases:
 2. Example: A patient has been prescribed a drug that undergoes significant first-pass metabolism. Explain what this means and discuss how it affects the drug's bioavailability.
 3. Answer Key: First-pass metabolism significantly reduces the bioavailability of drugs taken orally. So, the dosage may need to be adjusted accordingly. In some cases, alternative routes of administration or formulations that bypass the liver may be used to improve the drug's effectiveness.
- C. Long Answer Questions. One questions from unit 1&2 (1x20 = 20 Marks)
- Or
- Any practical in converted form can be taken for assessment- 25 Marks
- And
- Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks

Module 26 : Drug Development Process

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe: New drug development process, Experimental animals in preclinical research, Validation of Siddha drugs for safety, efficacy and appraise the regulations and ethical requirement for the usage of experimental animals

Conduct: Preclinical trials using various animal models

Identify: Suitable animal models, lead molecules for drug discovery and regulatory requirements for drug development

M 26 Unit 1 Methods of Drug discovery

26.1.1. New Drug development process 26.1.2. Preclinical trial Acute, subacute, chronic toxicity and therapeutic index studies 26.1.3. Clinical trials : Phases of clinical trials and their methodology 26.1.4. Regulatory approval and Drug development regulations: OECD guidelines for acute, repeated dose toxicity, dermal toxicity. WHO guidelines for evaluating the safety and efficacy of herbal medicines and CCRAS guidelines of Drug Development

References: 11,37,61,76,103,117,129,149,160,177,207,251

3A	3B	3C	3D	3E	3F	3G
CO4	Explain the stages of new drug development, describe preclinical and clinical trials and adopt ethical considerations of biomedical research	2	Lecture	CAP	Knows-how	IBL,ML,DIS,L&PPT,LS
CO4	Prepare protocol for evaluation of acute toxicity studies of Siddha formulation as per OECD guidelines	6	Experiential-Learning 26.1	PSY-GUD	Does	LS,ML,PAL
CO4	Prepare protocol for evaluation of repeated toxicity study of Siddha formulation as per OECD guidelines	10	Experiential-Learning 26.2	PSY-GUD	Does	SDL,LS,PL
CO4	Explain regulatory procedures needed to be carried out prior to the marketing of a new drug in India	1	Lecture	CC	Knows-how	BS,L&GD,L&PPT
CO4	Identify clinical signs of toxicity in experimental animals	2	Practical Training 26.1	CAP	Shows-how	DL,D

M 26 Unit 2 Reverse Pharmacology

26.2.1. Natural Products as Traditional Drugs 26.2.2. Reverse Pharmacology in Drug Discovery: Hits and Leads from Traditional Drugs for Drug Discovery,

Methodology and advantages

References: 157,177,207,210

3A	3B	3C	3D	3E	3F	3G
CO4	Apply Reverse pharmacology in drug development process	2	Lecture	CC	Knows-how	ML,L&P PT ,LS

M 26 Unit 3 Experimental animals in Preclinical research

26.3.1. Common laboratory animals, Advantages and disadvantages of animals experimentation 26.3.2. Ethical considerations: Ethical approval, applicable regulatory Guidelines (CCSEA), humane animal research (principles of 3Rs) and alternatives to animal experimentation 26.3.3. Anaesthetics used in animal research and chemical euthanasia

References: 11,32,37,39,61,75,76,103,114,177,180,182,207

3A	3B	3C	3D	3E	3F	3G
CO4	Explore experimental animals used in Drug research, alternatives used for drug research apply 3R principles in the conduct of research	2	Lecture	CC	Knows-how	W,DL,L_ VC,L&PP T
CO4	Adopt legal and ethical aspects of animal research and adopt. ethical principles in conducting animal experiments	1	Lecture	CAP	Knows-how	DL,L_VC ,RP,L&G D
CO4	Perform common experimental procedures required for evaluation of drug in animals	10	Practical Training 26.2	PSY-GUD	Does	ML,PAL, DL
CO4	Describe anaesthesia protocol for the conduct of short term procedures in experimental animals	10	Experiential-Learning 26.3	PSY-GUD	Does	DL,SIM, LS,TBL

M 26 Unit 4 Drug development during Pandemic

26.4.1. Stages in drug development during pandemic 26.4.2. Drug repurposing and conduct of clinical trial during pandemic

References: 177,196,207

3A	3B	3C	3D	3E	3F	3G
CO4	Prepare the concept proposal for the conduct of clinical trial during pandemic	8	Practical Training 26.3	PSY-GUD	Does	PL,TBL,J C,LS
CO4	Enlist the stages of Drug development during pandemic Describe drug repurposing and conduct of clinical trial during pandemic	2	Lecture	CC	Knows-how	L&GD,JC ,CBL

Practical Training Activity

Practical Training 26.1 : Clinical signs of toxicity identification in experimental animals using videoclips/charts

Total hours: 2

Collection of Literature- 1 hr

Identification and report submission- 1 hr

1. Review literature on common signs of toxicity, including neurological, gastrointestinal, respiratory, dermatological, and behavioral symptoms.
2. Observation Techniques:: Develop a checklist for observing and documenting signs systemwise.
3. Identify the signs of toxicity in the given charts/video clips
4. Create a report summarizing observed signs, comparing to baseline health indicators if available.
5. Ethical Considerations:: Discuss the importance of recognizing toxicity signs for animal welfare and ethical research.
6. Summarize the significance of early toxicity identification and its research implications.

Practical Training 26.2 : Handling, sexing and various routes of drug administration in experimental animals

Total hours: 10

Students should be trained to conduct the following

1. Handling Rats/mice/guinepig/rabbit-3 hrs

Approach calmly to avoid startling.

Use a secure grip: support the body with one hand and hold the tail with the other.

Minimize stress by keeping the environment quiet.

2. Sexing - 1 hr

3. Routes of Administration (oral,i.p, s.c etc)-6 hrs

Practical Training 26.3 : Concept proposal preparation for the conduct of clinical trial during pandemic

Total hours: 8

Literature collection: 3 hrs

Proposal preparation: 3 hrs

Case study presentation: 2 hr

I. The concept proposal should include the following:

1. Executive Summary

Summarize the proposal's key aspects, including objectives, significance, and methodologies.

2. Background and Rationale

Literature Review: Review existing research related to the trial topic.

Rationale: Explain the trial's necessity, especially in the context of the pandemic.

3. Objectives

Clearly define primary and secondary objectives of the trial.

4. Study Design

Type of Study: Describe the design (e.g., randomized controlled trial, observational study).

Population: Define target population and inclusion/exclusion criteria.

Intervention: Detail the interventions being tested.

5. Methodology

Recruitment Strategies: Outline participant recruitment methods, considering pandemic restrictions (e.g., virtual recruitment).

Data Collection: Describe data collection methods and safety measures (e.g., remote monitoring).

Ethical Considerations: Discuss ethical issues and informed consent adapted for remote settings.

Safety Measures: Detail safety protocols for participants and staff (e.g., PPE, social distancing, remote assessments).

6.Data Analysis Plan: Outline the statistical methods for data analysis.

7. Submit the proposal with the references used.

II. Case presentation:-Students should present relevant research stuides conducted during pandemic

Experiential learning Activity

Experiential-Learning 26.1 : Protocol preparation and case study presentation of acute toxicity studies of Siddha formulation as per OECD guidelines

Total hours: 6

Literature collection- 1 hr

Protocol preparation- 3 hrs

Case study presentation- 2 hrs

I. Students should prepare protocol to conduct acute toxicity studies of Siddha formulation as per OECD guidelines including the following details:

1. Objectives: Define primary objectives, such as determining the median lethal dose (LD50) and identifying toxic effects.

2. Background Information and rationale

3. Study Design

4. Materials and Methods

Test Substance: Describe the Siddha formulation's composition, dosage form, and preparation.

Dosing Regimen: Detail the dosing schedule (e.g., single oral dose), administration routes

5. Observations and Data Collection

Monitoring: Define monitored parameters (e.g., behavioral changes, physical signs of toxicity, weight) at intervals (1, 2, 4, 24 hours post-dosing).

Clinical Signs: List specific signs of toxicity (e.g., lethargy, tremors, mortality).

Duration of Observation: Indicate observation period

6. Data Analysis

Statistical Methods: Specify statistical methods for data analysis, including LD50 calculations.

Toxicity Classification: Explain classification of results based on OECD guidelines (e.g., Categories I–V).

II. Case study presentation: Students should present a case of Acute toxicity study of any Siddha formulation published in peer reviewed journal using OECD guidelines

Experiential-Learning 26.2 : Protocol preparation for repeated dose toxicity study of Siddha formulation as per OECD guidelines and mock presentation to Institutional Animal Ethics Committee (IAEC)

Total hours: 10

Literature collection: 2 hrs

Dose selection for Siddha formulations and animal dose conversion- 1 hr

Preparation of protocol: 3 hrs

I. Structure of the protocol should be as follows:

1. Background Information and rationale

2. Study Design

Test Species: Specify the animal model (e.g., rats, mice) and justify the choice based on relevance to human health.

3. Materials and Methods

Test Substance:

Describe the Siddha formulation, including its composition, dosage form, and preparation method.

Dosing Regimen and Randomization procedure, and Housing Conditions of animals.

4. Observations and Data Collection

Monitoring: Define parameters to be monitored (e.g., clinical signs, behavior, body weight) at regular intervals (e.g., weekly).

5. Histopathological and Biochemical Analysis

Organ Weighing: Specify which organs will be weighed and examined post-mortem.

Tissue Sampling: Outline protocols for tissue collection for histopathological evaluation.

Biochemical Tests: Identify any blood tests or biochemical markers to be assessed to evaluate systemic effects.

6. Data Analysis: Toxicity Assessment: Explain how results will be interpreted, including any dose-response relationships.

II. Form B Preparation for submission to IAEC- 3 hrs

III. Mock presentation to IAEC- 1 hr

Experiential-Learning 26.3 : Assignment submission on anaesthesia protocol in experimental animals and Group discussion

Total hours: 10

1. Literatures should be collected on Importance of anesthesia in research, animal selection, pre-anaesthetic preparation, anaesthesia protocol, , post-operative care and ethical consideration- 4 hrs

2. .Preparation of assignment- 2 hrs

The assignment should be structured as follows:

1. Introduction: Importance of anesthesia in research.

2. Animal Selection: Choose and justify the type of experimental animal.

3. Pre-Anesthetic Preparation: Health assessment and baseline monitoring., Fasting requirements and environment preparation.

4. Anesthesia Protocol: List and justify anesthetic agents and dosages., Describe monitoring techniques and pain management.

5. Post-Operative Care: Recovery monitoring and pain management.

6. Guidelines for feeding, hydration, and observing complications.

7. Conclusion: Summarize key protocol points and their significance.

References: Include citations.

3. Class presentation- 1 hr

Group Discussion: 3 hrs

Students will be grouped for discussion on

3.1. Anaesthesia for short term procedures- Half an hour

3.2. Anaesthesia for long term procedures- Half an hour

3.3 Ethical Considerations: Address animal welfare and relevant guidelines (e.g., ARRIVE, 3Rs)- 2 hrs.

Modular Assessment

Assessment method

Hour

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Choose any of the below assessment for 50 marks.

A. Problem based Assessment (PBA)-20 Marks

1. Example: Problem: Drug Discovery and Preclinical Testing

2. Scenario: A pharmaceutical company has identified a potential new drug candidate for the treatment of Alzheimer's disease.

The compound shows promising results in initial laboratory tests, but the company needs to determine whether the drug is safe for human use before moving forward.

3. Questions:

3.1. Describe the steps involved in preclinical testing for a new drug candidate. (5 marks)

3.2. What are the primary goals of preclinical studies? (5 marks)

3.3. How would you assess the safety profile of the new drug during the preclinical phase? (5 marks)

3.4. Explain the potential risks of advancing a drug into clinical trials without thorough preclinical testing. (5 marks)

4. Marking Criteria for PBA:

4.1. Understanding of Key Concepts: Clear understanding of the stages in drug development, such as discovery, preclinical testing.

4.2. Application of Knowledge: Ability to apply knowledge of the drug development process to real-world scenarios.

4.3. Critical Thinking: Analytical ability to discuss challenges, strategies, and outcomes in the drug development process.

4.4. Ethical Considerations: Awareness of ethical, regulatory, and safety issues involved in drug development.

B. Structured Educational Video- Assign each student various animal handling techniques for making a Structured Educational Video . (30 marks)

Student instructions

1. Create a 10 minute video demonstrating your understanding of proper experimental animal handling. The video should contain the following:

1.1. Introduction to Experimental Animal Handling (1 min)

1.2. Explain the importance of proper animal handling in research and identify common laboratory animals (1 min)

1.3. Ethical and Legal Considerations (1 min)

1.4. Mention relevant regulations and proper Techniques for Handling Animals (2 min)

1.5. Demonstrate and explain handling techniques for species like mice or rats, including restraint, lifting, and transferring animals and

4

1.6. Health and Safety Protocols (1 min)
 2. Record the video and submit
 Or
 Any practical in converted form can be taken for assessment-25 Marks
 And
 Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks

Semester No : 4

Module 27 : Systemic Pharmacology and Screening methods of Central Nervous System(CNS), Respiratory and Renal Drugs

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe: Systemic pharmacology of drugs acting on CNS and Respiratory disorders and their screening methods using animal models
 Conduct: Screening methods to scientifically validate Siddha drugs for their efficacy in treating CNS and respiratory disorders
 Identify: New lead molecules

M 27 Unit 1 Drugs acting on Central nervous system

27.1.1. Central neurotransmitters 27.1.2. Sedatives and hypnotics – anti anxiety drugs 27.1.3. Antiepileptics 27.1.4. General Anesthetics 27.1.5. Alcohols 27.1.6. Anti psychotics 27.1.7. Anti depressants 27.1.8. Opioid analgesics 27.1.9. Drugs used in neuro degenerative disorders

References: 29,102,179,189,236

3A	3B	3C	3D	3E	3F	3G
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CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of drugs acting on Central nervous system disorders	4	Lecture	CC	Knows-how	L&PPT, L_VC
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M 27 Unit 2 Preclinical Screening

27.2.1. Preclinical screening of new substances for the pharmacological activity using in vivo animal models. 27.2.1.1. Behavioral studies and muscle co ordination
27.2.1.2. CNS stimulants and depressants 27.2.1.3. Anxiolytics, anti-psychotics, anti epileptics and nootropics. 27.2.1.4. Drugs for neurodegenerative diseases

References: 61,75,76,114,117,246

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the pharmacological screening methods of CNS acting drugs using animal models	2	Lecture	CAP	Knows-how	L_VC,SI M,DL,DI S,PL
CO4	Perform in vivo animal experiments or simulated experiments, for experimental drug acting on Central nervous system disorders	10	Practical Training 27.1	PSY-GUD	Shows-how	DL,PAL, DIS
CO4	Describe common CNS disorders treated with Siddha therapy using hospital records.	10	Experiential-Learning 27.1	PSY-GUD	Does	JC,PL,TB L
CO4	Perform screening of Anti-convulsants and anti-depressants using animal models/simulation.	6	Experiential-Learning 27.2	PSY-GUD	Shows-how	DIS,IBL, CBL,DL

M 27 Unit 3 Drugs acting on Kidney and Respiratory System

27.3.1. Renal Physiology, Diuretics and Anti Diuretics 27.3.2. Respiratory system Drugs

References: 29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
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CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of drugs acting on Respiratory and renal disorders	2	Lecture	CC	Knows-how	L&PPT ,L_VC
M 27 Unit 4 Preclinical screening 27.4.1. Preclinical screening of new substances for the pharmacological activity using in vivo animal models. 27.4.1.1. Respiratory Pharmacology: antiasthmatics, drugs for COPD. 27.4.1.2. Renal Pharmacology: Diuretics and Anti-Urolithiasis. 27.4.1.3. Reproductive Pharmacology: Aphrodisiacs and antifertility agents References: 61,75,76,114,117,246						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe the pharmacological screening methods for drugs acting on renal and respiratory disorders using animal models	2	Lecture	CC	Knows-how	DL,L&PPT ,L&GD ,ML
CO4	Perform screening of Diuretics using Lipschitz test/Simulated experiment	5	Practical Training 27.2	CAP	Shows-how	DL,SIM
CO4	Document screening of Anti-asthmatics using Simulated experiment	5	Practical Training 27.3	CAP	Shows-how	DL,SIM
CO4	Compare various screening methods of Anti-parkinson agents in regard to assessment of mechanism of action of drug	10	Experiential-Learning 27.3	PSY-GUD	Does	LS,PAL
Practical Training Activity						
Practical Training 27.1 : Screening of drugs for CNS disorders using animal models/simulated experiment						
Total hours: 10 Students should be trained on the following using animal models or Simulated experiment 1. Screening of CNS stimulants using actophotometer/ Potentiation of sleeping time- 3 hrs 2. Screening of CNS depressants using actophotometer/ Potentiation of sleeping time- 3 hrs						

2. Screening of anxiolytics using any 2 models (elevated plus maze test/ open field test apparatus)- 4 hrs

Practical Training 27.2 : Screening of Diuretics using Lipschitz test/Simulated experiment

Total hours: 5

I. Study the mechanisms of Diuretics at various sites of nephron- 1 hr

II. Review 2-3 research articles of Diuretic screening of traditional formulations using various animal models- 1 hr

III. Conduct of experiment-3 hrs

Students should perform Lipschitz test using either experimental animals or simulated experiment

1. Group Formation: Form small groups (3-4 students).

2. Select Diuretics: Choose 2-3 diuretic agents for analysis.

3. Administer selected diuretics and monitor changes in urine output .

4. Record data and analyse

5. Analyse and discuss the effectiveness of each diuretic.

Practical Training 27.3 : Screening of Anti-asthmatics using animal model/Simulated experiment

Total hours: 5

I. Study the mechanisms of common anti-asthmatic drugs and asthma pathophysiology.- 1 hr

II. Review 2-3 research articles of Anti-asthmatic screening of traditional formulations using various animal models- 1 hr

III. Conduct of experiment-3 hrs

1. Group Formation: Form small groups (3-4 students) to collaborate.

2. Select Agents: Choose 2-3 anti-asthmatic agents for analysis.

3. Perform experiment on animal / simulation

4. Simulation Steps: Set up the respiratory model in the software and input asthma parameters.

Administer selected agents, observing effects on airway resistance and lung function.

Record data on efficacy.

5. Data Analysis: Compare results with a control group (no treatment).

Experiential learning Activity

Experiential-Learning 27.1 : Data collection on common CNS disorders treated with Siddha therapy using hospital records.

Total hours: 10

1. Identify common CNS disorders relevant to Siddha therapy (e.g., anxiety, epilepsy, neurodegenerative disorder).- 2 hrs
2. Obtain Permissions: Request access to hospital records from administration, ensuring compliance with ethical guidelines.
3. Develop a data collection template to record- 1 hr
4. Organize findings using software like Excel. Identify trends and consider creating visual representations (charts/graphs)- 3 hrs
5. Write a summary report (2 hrs) with purpose and importance of the survey., Implications and recommendations. Include ethical considerations regarding patient confidentiality.
6. Prepare power point and deliver a presentation- 2 hrs

Experiential-Learning 27.2 : Screening of anti-epileptics and anti-depressants

Total hours: 6

Students should be trained on the following using animal models or Simulated experiment

1. Screening of anti-epileptics using convulsimeter -3 hrs
2. Screening of anti-depressants using forced swimming test- 3 hrs

Experiential-Learning 27.3 : Report submission and group discussion on mechanism based screening methods of anti-parkinson drugs.

Total hours: 10

Literature collection-3 hrs

Report preparation- 3 hrs

Class presentation- 2 hrs

Group discussion-2 hrs

I. Should collect the information and discuss as per the following instruction:

1. Collect literatures from PubMed, Google Scholar, and ScienceDirect.
2. Select recent, peer-reviewed articles.
3. Compile Articles and create a reference list with article details (title, authors, journal, year).
4. Note key findings related to compounds and their mechanisms.
5. Prepare the report including the following: Introduction (½ page): Overview of Parkinson's disease and report purpose.

Summary of Findings (1-2 pages): Summarize each article, focusing on: Specific agents studied., Proposed mechanisms.

Key clinical/preclinical results, Conclusion (½ page): Recap findings and suggest future research directions, References: List all articles in a standardized citation style and submit the report.

II. Prepare a PowerPoint and deliver it in class

III. Group discussion with peers

Modular Assessment

Assessment method

Hour

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Choose any of the below assessment for 50 marks.

A. Long Answer Questions. One questions from unit 1-4 1x20 = 20 Marks

B. Open Response Questions: (30 marks)

1. Frame 6 open response questions to assess the student's real-world understanding of preclinical in vivo screening for drugs effective in CNS disorders, highlighting the key aspects of drug efficacy, safety, and mechanisms of action.

2. Prepare rubrics and grade accordingly

3. Example- Open response question- How can memory enhancement drugs be assessed in preclinical in vivo studies, and what behavioral tasks are commonly used to evaluate cognitive function?

4. Expected response: Memory enhancement drugs in preclinical studies are evaluated using cognitive function tests that measure learning and memory.

Common tests include the Morris water maze for spatial learning, the novel object recognition test for recognition memory, the Y-maze for working memory, and the radial arm maze for spatial memory. These behavioral tests help determine whether a drug improves memory and cognitive performance, particularly in conditions like Alzheimer's disease or age-related cognitive decline.

5. Assessment rubrics - *Excellent: understanding of the topic with minimal errors.

*Very Good: Has good grasp but has some minor mistakes.

*Good: Good understanding

*Fair: Understanding is limited, with several errors.

*Poor: major misunderstandings or wrong answer

Or

Any practical in converted form can be taken for assessment-25 Marks

And

Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks

4

Module 28 : Systemic Pharmacology and Screening methods of Autonomic Nervous System (ANS) and Cardiovascular System (CVS) Drugs

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe: Systemic pharmacology of drugs acting on ANS and CVS disorders and their screening methods using animal models

Conduct: Screening methods to scientifically validate Siddha drugs for their efficacy in treating CVS and ANS disorders

Identify: New lead molecules

M 28 Unit 1 Autonomic Nervous System

28.1.1. General Consideration, of Autonomic nervous system 28.1.2. Adrenergic agonist 28.1.3. Adrenergic antagonists, 28.1.4. Cholinergic agonists, 28.1.5. Anticholinesterases drugs 28.1.6. Anticholinergic drugs, Skeletal muscle relaxant

References: 29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of drugs acting on ANS	3	Lecture	CC	Knows-how	L&PPT
CO4	Demonstrate the effect of drugs acting on ANS using animal/Simulated experiment	8	Practical Training 28.1	CAP	Shows-how	DL,TUT, SIM

M 28 Unit 2 Cardiovascular Drugs

28.2.1. Cardiac physiology 28.2.2. Drugs used in Myocardial ischemia 28.2.3. Drugs used in Congestive Cardiac Failure (CCF) 28.2.4. Anti-Hypertensive drugs 28.2.5. Antiarrhythmic drugs 28.2.6. Drugs for Hypercholesterolemia

References: 67,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of drugs acting on CVS	4	Lecture	CC	Knows-how	L&PPT
CO4	Document Siddha formulations and medicinal herbs used in combating cardiovascular complications	6	Experiential-Learning 28.1	PSY-GUD	Does	BL,TBL,DIS,ML,LS

M 28 Unit 3 Preclinical Screening

28.3.1. Preclinical screening of new substances for the pharmacological activity using in vivo animal models. 28.3.1.1. Cardiovascular Pharmacology: antihypertensives 28.3.1.2. Antiarrhythmics 28.3.1.3. Antianginal and antiatherosclerotic agents

References: 61,75,76,114,117,246

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the pharmacological screening methods of drugs acting on CVS using animal models	2	Lecture	CC	Knows-how	L&GD,L_VC
CO4	Demonstrate the effects of drugs on blood pressure (vasopressor and vasodepressors with appropriate blockers) using Simulated experiment	4	Practical Training 28.2	CAP	Shows-how	SIM,D-M
CO4	Critically review and present journal articles focused on the anti-hypertensive effects of traditional formulations.	10	Experiential-Learning 28.2	CAN	Does	JC,LS,ML
CO4	Create awareness about the role of Siddha way of life style and Diet in combating cardiovascular complications	10	Experiential-Learning 28.3	PSY-GUD	Does	L&GD,RP,DIS,LS,L_VC

M 28 Unit 4 In vitro experimentation

28.4.1. Advantages and disadvantages of in vitro experimentation 28.4.2. Animal cell-culture techniques, cell counting and cell viability assays.

References: 11,39,76,114,117,180,246

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the various invitro techniques with its advantages & disadvantages and detail cell culture techniques and assays	1	Lecture	CC	Knows-how	L&PPT, L_VC
CO4	Explore in vitro techniques for drug screening, their advantages, limitations, and applications.	8	Practical Training 28.3	CC	Does	ML,L&G D,BL,BS, PL

Practical Training Activity

Practical Training 28.1 : Effect of drugs acting on ANS using animal/Simulated experiment

Total hours: 8

1. Study the pharmacology of selected mydriatic and miotic drugs and the anatomy of the rabbit eye- 2 hrs.
2. Group Formation: Form small groups (3-4 students).
3. Select Drugs: Choose 2-3 mydriatic and/or miotic agents for analysis.
4. Conduct of experiment- mydriatic drugs (3 hrs), miotic drugs (3 hrs)
 - 4.1. Set up the eye model in the software and input relevant parameters.
 - 4.2. Administer selected drugs and monitor changes in pupil size.
 - 4.3. Record data on baseline pupil diameter, changes after administration, duration of effects.
 - 4.4. Compare results with a control scenario (no treatment).
 - 4.5. Analyze the effectiveness of each drug.

Practical Training 28.2 : Screening of anti-hypertensive drugs using Simulated experiment

Total hours: 4

1. Study the pharmacology of selected vasopressors (e.g., norepinephrine) and vasodepressors (e.g., nitroglycerin), and their blockers- 1 hr
2. Group Formation: Form small groups (3-4 students).
3. Select Drugs: Choose 2-3 vasopressor and/or vasodepressor agents for analysis.

4. Conduct of experiment- 3 hrs

4.1. Simulation Steps: Set up the cardiovascular system model in the software and input baseline parameters, administer selected drugs and their blockers, monitoring changes in blood pressure and heart rate.

4.2. Record data on baseline readings, changes after administration.

4.3. Compare results with a control scenario (no treatment) and analyze the effectiveness of each drug.

Practical Training 28.3 : Group discussion on in vitro techniques for drug screening.

Total hours: 8

1. Group Formation: Form small groups of 4-6 students.

2. Gather information on techniques like cell-based assays, biochemical assays, high-throughput screening (HTS), microfluidics, and 3D cell cultures.- 3 hrs

3. Presentation: Prepare a 10-15 minute presentation with visual aids- 1 hr

4. Discussion Points: Define in vitro screening and its importance. Summarize each technique's process, applications, advantages, and limitations- 2 hrs.

5. Discuss how these methods complement in vivo studies and future technological advancements- 1 hr

6. Class Discussion: Engage in a broader discussion after presentations, encouraging questions and sharing insights- 1 hr

Experiential learning Activity

Experiential-Learning 28.1 : Literature review on Siddha formulations and medicinal herbs for cardiovascular complications

Total hours: 6

Students have to work in groups.

1. Students should learn the basics of Siddha and its approach to heart health.- 1 hr

2. They have to explore literature search techniques to find relevant scientific studies and resources. Students will review scientific papers on Siddha formulations and medicinal herbs, critically analyzing their cardiovascular benefits- 3 hrs

3. They have to synthesize the findings from both scientific and traditional sources and organize them into a structured literature review.- 1 hr

4. Students should present their findings and engage in a discussion on integrating Siddha practices with modern cardiovascular treatments.- 1 hr

Experiential-Learning 28.2 : Journal club presentation to critically review research articles

Total hours: 10

1. Article Selection: Choose 3-5 relevant and recent journal articles- 2 hrs.

2. Research Background: Familiarize yourself with hypertension and traditional medicine- 2 hrs
3. Group Formation: Form small groups (3-4 students).
4. Review Process: Read and Analyse Articles: Focus on study aims, methodologies, results, limitations, and clinical implications. Take Detailed Notes: Highlight key points and interesting findings- 3 hrs.
5. Presentation Preparation: Summarize introduction, findings, methodologies, and discussion points-2 hrs.
6. Engage the Audience: Prepare questions to encourage participation.
7. Facilitate Discussion: Engage peers in discussing the significance and gaps in research- 1 hr.

Experiential-Learning 28.3 : Awareness creation for Siddha way of life style and Diet for cardiovascular complications

Total hours: 10

Students should work in groups.

1. Students should use credible online resources for conducting awareness.
2. Presentation tools (PowerPoint, posters, pamphlets) and engaging activities (e.g., workshops, cooking demos) can be used to create awareness
3. Gather Information: Collect data on Siddha dietary and lifestyle recommendations- 2 hrs
4. Analyse Benefits: Examine how these practices promote cardiovascular health- 1 hr
5. Awareness Campaign Development:: Create Informative Materials: Develop presentations and pamphlets summarizing key points- 4 hrs.
6. Engage the Audience: Conduct awareness lectures/workshops- 2 hrs
7. Facilitate Discussions: Encourage questions to deepen understanding- 1 hr

Modular Assessment

Assessment method

Conduct a Structured Modular Assessment. Assessment will be for 25 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Choose any of the below assessment for 50 marks.

- A. Long Answer Questions. One questions from unit 2-3 (1x20 = 20 Marks)
- B. Short Answer Questions. Two questions from unit 1-4 (2x5=10 Marks)
- C. Quiz from Unit 1-3. (20 Marks). Students have to be divided into groups. Each group will be asked with a questions and the score should be recorded based on the answer.

1. The structure of the quiz shall be as follows:

Hour

4

1.1. Multiple choice questions

1.2. True or false questions

1.3. Visual based questions

Or

Any practical in converted form can be taken for assessment-25 Marks

And

Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks

Semester No : 5

Module 29 : Systemic Pharmacology and Screening methods of Autacoids and Gastrointestinal Tract(GIT) Drugs

Module Learning Objectives

(At the end of the module, the students should be able to)

Describe: Systemic pharmacology of drugs acting on GIT and autocoid disorders and their screening methods using animal models

Conduct: Screening methods to scientifically validate Siddha drugs for their efficacy in treating GIT and autocoid disorders

Identify: Adverse effects and new lead molecules

M 29 Unit 1 Gastrointestinal System

29.1.1. Antiemetics 29.1.2. Drugs for peptic ulcer 29.1.3. Anti-diarrheal agents, Laxatives & purgatives

References: 29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic	3	Lecture	CC	Knows-	L&PPT

	uses and adverse effects of drugs acting on GIT disorders				how	
M 29 Unit 2 Preclinical screening 29.2.1. Preclinical screening methods for Gastrointestinal drugs 29.2.1.1. Anti ulcer 29.2.1.2. Anti -emetic 29.2.1.3. Antidiarrheal and laxatives References: 61,75,76,114,117,246						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe the pharmacological screening methods of drugs acting on GIT using animal models	3	Lecture	CC	Knows-how	L&PPT, L&GD
CO4	Demonstrate the anti ulcer activity of drugs using animal model/Simulated experiment	10	Practical Training 29.1	CAP	Shows-how	DL, SIM
M 29 Unit 3 Autacoids and Related drugs 29.3.1. Histamine and antihistamines 29.3.2. NSAIDS, Anti rheumatoid- anti-gout and immunomodulatory agents 29.3.3. Preclinical screening methods for Analgesics, antiinflammatory and antipyretic agents. References: 29,102,179,182,189,236						
3A	3B	3C	3D	3E	3F	3G
CO4	Describe the pharmacological screening methods of drugs acting on autocoids	4	Lecture	CC	Knows-how	L&GD, L&PPT
CO4	Demonstrate the analgesic, anti-inflammatory activity of drugs using animal models or simulated experiment	10	Practical Training 29.2	CAP	Shows-how	SIM, DL, DIS
CO4	Describe the Pharmacology of NSAIDs, anti-ulcer drugs and clinical decision making skills in patient care.	8	Experiential-Learning 29.1	PSY-GUD	Does	ML, TBL, LS, CBL, L&GD

CO4	Explore integrated treatment approaches for Rheumatoid Arthritis (RA) using modern medicine and Siddha practices.	8	Experiential-Learning 29.2	PSY-GUD	Does	PAL,LS,ML,PER
CO4	Analyse and evaluate literature on anti-ulcer formulations in Siddha medicine and their scientific validation through recent research articles.	10	Experiential-Learning 29.3	PSY-GUD	Does	TBL,ML,LS,PAL,DIS

Practical Training Activity

Practical Training 29.1 : Demonstration of anti ulcer activity of drugs using animal model/Simulated experiment

Total hours: 10

1. Introduction to Gastric Ulcers and Anti-Ulcer Drugs- 1 hr
2. Inducing ulcers in animal models/simulation using aspirin or ethanol or pylorus ligation for testing- 2 hrs
3. Screening of Proton pump inhibitors- 2 hrs.
4. Screening of H2 Receptor Antagonists- 2 hrs.
5. Screening of Antacids and Cytoprotective Agents- 1hr
6. Data Analysis and Interpretation- 1 hr
7. Review, Conclusion, and Reporting- 1 hr

Practical Training 29.2 : Screening of analgesic, anti-inflammatory activity of drugs using animal models or simulated experiment

Total hours: 10

Screening of analgesics-4 hrs

Screening of anti-inflammatory drugs- 4 hrs

1. Group Division: Assign drugs and control groups to student teams.
2. Simulating Pain and Inflammation: Create a model representing pain and inflammation in software.
3. Drug Administration: Simulate administering the assigned drug to the experimental group.
4. Observation: Measure pain and inflammation after a set time and record changes.
5. Data Analysis: Compare results between drug and control groups.
6. Summarize findings and discuss implications for real-world applications- 2 hrs

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Experiential learning Activity

Experiential-Learning 29.1 : Drug Identification & Classification Workshop on NSAIDs and Anti-Ulcer Drugs:

Total hours: 8

1. Lecture on Introduction to NSAIDs & Anti-Ulcer Drugs - 1 hr
2. Hands-on identification and classification of various NSAIDs based on structure, mechanism, and therapeutic uses-2 hrs
3. Discussion on common side effects and drug interactions, focusing on safety and precautions-1 hr
4. Anti-Ulcer Drugs Identification & Classification- 1 hr
6. Lecture on Herbal Alternatives & Integrative Approaches - 1 hr
7. Work on clinical case studies to decide on the best drug treatments for patients with arthritis and ulcers-1 hr
8. Review key concepts through a quiz and open discussion to clarify doubts and gather feedback- 1 hr.

Experiential-Learning 29.2 : Assignment on integrated Siddha and modern treatment approaches for Rheumatoid Arthritis (RA).and interactive discussion

Total hours: 8

Literature collection: 3 hrs

Preparation of assignment- 3 hrs

I. Structure of Assignment should be as follows:

1. Introduction: Brief overview of RA.
2. Modern Treatments: Discuss benefits and limitations.
3. Siddha Treatments: Describe specific remedies and approaches.
4. Integrated Approach: Propose how combining treatments can enhance outcomes.
5. Cite 5-7 credible sources

Interactive Discussion-2 hrs

II. Discussion points:

1. Evidence-based practices on combining modern anti-arthritic drugs with Siddha therapies - 1 hr
2. Comparing traditional remedies with pharmaceutical treatments in terms of efficacy and patient outcomes- 1 hr

Experiential-Learning 29.3 : Group discussion on anti-ulcer formulations in Siddha medicine and their scientific validation.

Total hours: 10

1. Group Formation: Form small groups of 4-6 students.

2. Literature Collection: Gather recent research articles and studies on anti-ulcer formulations in Siddha medicine.-3 hrs 3. Preparation of power point - 1 hr Discussion points: 3.1. Review Guidelines: Summarize key findings, specific formulations, and their traditional uses-1 hr 3.2. Highlight scientific validation from the literature (e.g., clinical trials, in vivo and in vitro studies)- 1 hr 3.3. Formulations: List and describe common anti-ulcer formulations- 1 hr 3.4. Scientific Evidence: Evaluate the quality of the validation presented-1 hr 3.5. Comparative Analysis: Compare Siddha formulations with modern medications if relevant- 1 hr 3.6. Discussion Questions:Identify research gaps, Discuss integration of traditional knowledge with modern science, Explore implications for future research-1 hr	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment.Assessment will be for 50 marks.Keep structured marking pattern.Use different assessment methods in each module for the semester.Keep record for the structured pattern used for assessment.Calculate the Modular grade point as per table 6C. Choose any of the below assessment for 50 marks. A. Long Answer Questions.Two questions from unit 1-3 (2x20 = 40 Marks) B. Short Answer Questions. Two questions from unit 1-3 (2x5=10 Marks) Or Any practical in converted form can be taken for assessment-25 Marks And Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks	4
Module 30 : Systemic Pharmacology and Screening methods of Drugs acting on Hormones and blood forming agents	
Module Learning Objectives (At the end of the module, the students should be able to)	

Describe: Systemic pharmacology of drugs acting on Hormonal and blood disorders and their screening methods using animal models
 Conduct: Screening methods to scientifically validate Siddha drugs for their efficacy in treating Hormonal and blood disorders
 Identify : Adverse effects and new lead molecules

M 30 Unit 1 Drugs acting on Hormones

30.1.1. Insulin, Oral hypoglycemic agents 30.1.2. Thyroxine & Antithyroid drugs 30.1.3. Estrogens and Antagonists 30.1.4. Progestins and Antagonists, Oral Contraceptives, Testosterone and Anabolic steroids

References: 29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of drugs acting on metabolic and Hormonal disorders	3	Lecture	CC	Knows-how	L_VC,L&PPT

M 30 Unit 2 Drugs affecting blood and blood formation

30.2.1. Anemia- iron deficiency 30.2.2. Coagulants and anti coagulants 30.2.3. Antiplatelets, antithrombotic and fibrinolytic drugs

References: 29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of drugs acting on blood and blood forming agents	2	Lecture	CC	Knows-how	L&PPT , L&GD,IBL

M 30 Unit 3 Screening Methods

30.3.1. Screening methods of Drugs for metabolic disorders like anti-diabetic agents. 30.3.2. Screening of Anti cancer agents 30.3.3. Hepatoprotective screening methods

References: 61,75,76,114,117,246

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the pharmacological screening methods of drugs acting on Hormonal and blood disorders	3	Lecture	CC	Knows-how	L&GD,L&PPT,IBL
CO4	Explore mechanism based Screening methods of Type-2 Antidiabetic agents	10	Practical Training 30.1	PSY-GUD	Does	ML,LS,Mnt,PAL

M 30 Unit 4 Screening methods

30.4.1. Drug screening methods used in screening of 30.4.1.1. Antifungal agents 30.4.1.2. Antibacterial drugs 30.4.1.3. Antiviral agents

References: 61,76,105,106,107,114,117,246

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the anti-viral, anti-bacterial and anti-fungal screening methods	2	Lecture	CC	Knows-how	L&GD,IBL,L&PPT
CO4	Demonstrate the anti-bacterial activity of selected drugs through in vitro methods.	10	Practical Training 30.2	CAP	Knows-how	W,DIS,SIM,DL
CO4	Describe screening methods for anti-viral drugs.	10	Experiential-Learning 30.1	CAP	Shows-how	FV
CO4	Describe screening methods for anti-cancer drugs.	10	Experiential-Learning 30.	CAP	Shows-how	FV,ML,DL

			2			
CO4	Analyse the use of traditional medicines as prophylactics during the COVID-19 pandemic, focusing on effectiveness, and public perception.	6	Experiential-Learning 30.3	CAP	Shows-how	LS,PAL, ML

Practical Training Activity

Practical Training 30.1 : Group discussion on mechanism based Screening of Type-2 Antidiabetic agents

Total hours: 10

I. Research Component: Each group member should select at least one scholarly article, book, or credible source related to the topic. Summarize the key arguments and findings from your sources.- 3 hrs

II. Presentation Preparation: Create a PowerPoint presentation (10-15 slides) that includes introduction to the topic, key findings from each member's research., synthesis of the group's discussion points. and conclusions- 2 hrs

Group Analysis:

1. Discuss the different perspectives and insights gathered.- 1 hr
2. Identify common themes, contrasting views, and any gaps in the literature- 1 hr.
3. Discuss the screening methods employed for type I and Type II Diabetes- 1 hr
4. Discuss research articles of screening of Siddha drugs for anti-diabetic potentials- 1 hr
5. A one-page summary of your group discussion highlighting the main points and questions should be submitted for further exploration- 1 hr

Practical Training 30.2 : Anti-bacterial activity of drugs through in vitro methods/simulated experiments.

Total hours: 10

1. Familiarize with antibacterial principles and testing methods (e.g., disk diffusion).- 2 hrs
2. Learn to determine the MIC of drugs through serial dilution and observation of bacterial growth.- 2 hrs
3. Discuss antibiotic resistance mechanisms and observe bacterial resistance to antibiotics-1 hr
4. Conduct the invitro/simulated experiment-3 hrs
5. Data analysis- 1 hr
6. Guide students in report writing, and discuss real-world applications of findings- 1 hr

Experiential learning Activity	
Experiential-Learning 30.1 : Field Visit to R&D institutes/Labs to learn screening methods of anti-viral drugs	
Total hours: 10 1. Familiarize yourself with drug development concepts- 1hr 2. During the Visit to R&D institutes/research labs/Pharma industries observe and take notes on techniques and findings of invitro methods for screening of anti viral drugs- 8 hrs 3. Submit report - 1 hr	
Experiential-Learning 30.2 : Field Visit to R&D institutes/Labs to learn screening methods of anti-cancer drugs	
Total hours: 10 1. Familiarize yourself with drug development concepts- 1 hr. 2. During the Visit to R&D institutes/research labs/Pharma industries observe and take notes on techniques and findings of invitro methods for screening of anticancer drugs- 8 hrs 3. Submit report- 1 hr	
Experiential-Learning 30.3 : Assignment on propylactic traditional medicines tried during COVID pandemic	
Total hours: 6 Literature collection- 3 hrs Assignment preparation: 2 hrs Class presentation- 1 hr Assignment should be structured as follows: 1. Overview of traditional medicines and their relevance during health crises. 2. Background: Impact of COVID-19 and the concept of prophylactic measures in traditional medicine. 3. Traditional Medicines: Identify specific traditional medicines used, their origins, and usage. 4. Effectiveness: Analyse research or evidence regarding their effectiveness against COVID-19. 5. Conclusion: Summarize findings and suggest future research areas.	
Modular Assessment	
Assessment method	Hour

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C. Choose any of the below assessment for 50 marks. A. Long Answer Questions. One questions from unit 1-4 (1x20 = 20 Marks) B. Theory case study from Unit-3 (30 Marks) Students will be given case study questions to apply their knowledge of drugs and animal models while also considering ethical, pharmacological, and safety aspects of preclinical drug testing. Or Any practical in converted form can be taken for assessment-25 Marks And Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks	4
Semester No : 6	
Module 31 : Anti-microbials and Clinical Pharmacology	
Module Learning Objectives (At the end of the module, the students should be able to) Describe: Pharmacotherapy of anti-microbials and Drugs and Cosmetics Act Conduct: Clinical trial of all phases Identify : New Drug	
M 31 Unit 1 General principles of antimicrobial therapy 31.1.1. Anti-tubercular drugs 31.1.2. Anti-leprotic drugs 31.1.3. Antimalarial drugs 31.1.4. Drugs for Urinary tract infection 31.1.5. Antifungal drugs 31.1.6. Antiviral drugs 31.1.7. Antiprotozoal drugs 31.1.8. Anticancer drugs	

References: 29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the classification, mechanism of action, pharmacological actions, therapeutic uses and adverse effects of Anti-microbials and Chemotherapeutic agents	5	Lecture	CC	Knows-how	L&GD,L &PPT
CO4	Develop a structured Informed Consent Form (ICF) for clinical trials or research studies.	10	Practical Training 31.1	CAP	Shows-how	LS,PAL, ML

M 31 Unit 2 Clinical trials

31.2.1. Phases of clinical trial – their purpose and methodology. 31.2.2. Good Clinical Practice (GCP) 31.2.3. Protocol designing, placebos, Ethical aspects of clinical trials

References: 25,31,64,73,74,103,129,177,180,207

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the ethics and methodology of conduct of clinical trials	3	Lecture	CC	Knows-how	L&GD,L &PPT
CO4	Develop a comprehensive protocol to evaluate the efficacy of a Siddha formulation in a Phase II clinical trial.	10	Experiential-Learning 31.1	PSY-GUD	Does	LS,ML,D IS,BL
CO4	Describe the importance and list of essential medicine for a health care facility	6	Experiential-Learning 31.2	CAP	Shows-how	PAL,ML, LS
CO4	Develop a comprehensive protocol to evaluate the efficacy of a Siddha formulation in a Phase II clinical trial.	10	Experiential-Learning 31.3	PSY-GUD	Does	ML,LS

M 31 Unit 3 Drug regulatory requirements

31.3.1. Drug regulatory requirements for clinical trials in India 31.3.2. Drugs and Cosmetic act 31.3.3. The New Drugs and Clinical Trials Rules, 2019.

References: 31,64,73,129

3A	3B	3C	3D	3E	3F	3G
CO4	Describe and apply the Drug regulatory requirements for clinical trials in India	2	Lecture	CC	Knows-how	L&GD,L &PPT
CO4	Document the regulatory guidelines for the conduct of Clinical trial in Ayush drugs	10	Practical Training 31.2	PSY-GUD	Does	LS,ML

Practical Training Activity

Practical Training 31.1 : Structured informed consent form (ICF) preparation

Total hours: 10

1. Understand Informed Consent: Learn its ethical importance in protecting participant rights and review relevant regulatory guidelines - 3 hrs
2. Key Components of ICF: Study overview, eligibility criteria, procedures, risks, and benefits, Confidentiality, voluntary participation, and participant rights to withdraw, compensation, contact details, and participant understanding- 4 hrs.
3. Clear and Simple Language: Ensure the ICF is written in plain language for easy understanding and provide translations if necessary.
4. Ethical Considerations: Emphasize voluntariness, confidentiality, and address consent for vulnerable populations (e.g., minors)- 1 hr
5. Conclusion: Summarize the importance of the ICF in clinical trials.
6. Submit a informed consent form for a given case- 2 hrs

Practical Training 31.2 : Assignment on regulatory guidelines for the conduct of Clinical trial in Ayush drugs

Total hours: 10

- I. Literature collection- 2 hrs
- II. Assignment preparation- 2 hrs
- III. Class interaction- 6 hrs

Assignment should be structured as follows:

1. Introduction to AYUSH Drugs and Clinical Trials: Discuss the importance of clinical trials in ensuring the safety and efficacy of AYUSH drugs.
2. Research on Regulatory Guidelines: Explain various research guidelines to be used for the conduct of clinical trials of Ayush drugs.

3. Key Regulatory Requirements: Include the approval process, clinical trial protocols, safety monitoring, and GMP regulations for Ayush drugs.

Class interaction topics:

I. Ethics in Clinical Trials: Discuss on informed consent, participant protection, and data privacy in Ayush drug trials- 2 hrs.

III. Case Studies/Examples: Analyze real-world clinical trials of Ayush drugs. Prepare class presentation,for discussing regulatory challenges and the unique aspects of Ayush drug trials.- 2 hrs

IV. Documentation and Reporting: Review the documentation required for trials, including ethics committee approvals, trial registration, and data reporting- 2 hrs

Experiential learning Activity

Experiential-Learning 31.1 : Protocol preparation for the conduct of Phase III clinical trial of Siddha formulation

Total hours: 10

I. Literature collection: 3 hrs

II. Protocol preparation: 3 hrs

III. Class interaction: 4 hrs

Protocol Components should include:

1. Summary of the trial's purpose, methodology, and expected outcomes
2. Introduction: Background on the disease, rationale for the trial, and objectives.
3. Study Design: Type of study (e.g., randomized, double-blind), intervention details, and control group description.
4. Eligibility Criteria: Inclusion and exclusion criteria for participants.
5. Study Population: Sample size justification and recruitment strategies.
6. Endpoints: Primary and secondary endpoints, with assessment methods.
7. Statistical Analysis: Overview of statistical methods for data collection and analysis.
8. Safety Monitoring and Ethical Considerations:

Experiential-Learning 31.2 : Prepare a list of essential medicine for a health care facility

Total hours: 6

1. Understand the concept of Essential Medicines List for the healthcare facility - 2 hrs
2. Identify the factors that determine the choice of drugs in an Essential Medicines List- 2 hrs.
3. Prepare a list of essential medicines for a healthcare facility, with justification in a given scenario- 2 hrs

Experiential-Learning 31.3 : Protocol preparation for conducting Phase II clinical trial of a Siddha formulation .

Total hours: 10

I. Literature collection- 3 hrs

II. Protocol preparation: 3 hrs

III. Class interaction: 4 hrs

Protocol Components should include:

1. Summary of the trial's purpose, methodology, and expected outcomes
2. Introduction: Background on the disease, rationale for the trial, and objectives.
3. Study Design: Type of study (e.g., randomized, double-blind), intervention details, and control group description.
4. Eligibility Criteria: Inclusion and exclusion criteria for participants.
5. Study Population: Sample size justification and recruitment strategies.
6. Endpoints: Primary and secondary endpoints, with assessment methods.
7. Statistical Analysis: Overview of statistical methods for data collection and analysis.
8. Safety Monitoring and Ethical Considerations:

Modular Assessment

Assessment method

Hour

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Choose any of the below assessment for 50 marks.

A. Group Project from Unit-2 (30 Marks)

1. Project questions will be given to assess the students' understanding of clinical trial processes (trial design, regulatory and ethical considerations, safety monitoring, and data analysis).
2. Example: Develop a hypothetical clinical trial protocol for testing a new drug. What are the critical elements that should be included?
3. Expected Response: The protocol should outline the study objectives, eligibility criteria, study design (e.g., randomization, blinding), dosage and treatment schedule, methods of data collection, statistical analysis plan, informed consent procedures, and ethical considerations. It should also address safety monitoring, adverse event reporting, and participant recruitment strategies.

B. Class presentation from Unit-3 (10 Marks)

C. Short Answer Questions: Two questions from Unit-1 (2x5=10 Marks)

4

Or
Any practical in converted form can be taken for assessment-25 Marks
And
Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks

Module 32 : Recent advances in Pharmacology

Module Learning Objectives
(At the end of the module, the students should be able to)

Describe: System Biology and Computational Biology
Conduct : Free radical scavenging effect
Identify: Lead molecules for drug development

M 32 Unit 1 Introduction to Network Pharmacology

32.1.1. Challenges in traditional drug discovery approaches 32.1.2. Principles of Network Pharmacology, significance of multi-component and multi-target interaction

References: 23,83,92,103,160,177,180,207,235,236,237

3A	3B	3C	3D	3E	3F	3G
CO4	Describe System and computational biology in drug research	5	Lecture	CC	Knows-how	L_VC,L&PPT

M 32 Unit 2 Pharmacogenomics

32.2.1. Personalized medicine and precision medicine 32.2.2. Inter individual differences in therapeutic response to drugs, susceptibility to adverse effects 32.2.3. Polymorphism of drug metabolizing enzymes

References: 25,29,102,179,182,189,236

3A	3B	3C	3D	3E	3F	3G
CO4	Describe Pharmacogenomics in individual variations, susceptibility to disease and response to Siddha drugs	3	Lecture	CAP	Knows-how	L&GD,L &PPT
CO4	Compile and document information about Ayurgenomics focusing on its methodologies, findings, and implications.	10	Practical Training 32.1	PSY-GUD	Does	JC,LS,PA L,ML
CO4	Integrate pharmacogenomics with Siddha principles to explore individual variations in disease susceptibility and drug response.	10	Experiential-Learning 32.1	CAP	Shows-how	PAL,LS, ML

M 32 Unit 3 Free radicals Pharmacology

32.3.1. Generation of free radicals 32.3.2. Role of free radicals in diabetes, neurodegenerative diseases and cancer. 32.3.3 Protective activity of certain important antioxidants

References: 78,103,158,160,177,207,238,239

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the role of free radicals in diseases and anti-oxidants in therapy	2	Lecture	CC	Knows-how	L&PPT , L&GD,L _VC
CO4	Integrate pharmacogenomics with Siddha medicine to explore individual variations in disease susceptibility and drug response.	10	Experiential-Learning 32.2	CAN	Does	LS,ML,P AL
CO4	Integrate pharmacogenomics with Siddha medicine to explore individual variations in	6	Experiential-	CAP	Shows-	LS,ML

	disease susceptibility and drug response.		Learning 32.3		how	
CO4	Compile and document medicinal herbs having free radical scavenging effects	10	Practical Training 32.2	CS	Does	LS,ML,J C

Practical Training Activity

Practical Training 32.1 : Journal club review on research article on Ayurgenomics..

Total hours: 10

1. Learn about how Ayurgenomics combines Ayurveda with genomics to create personalized medicine.- 2 hrs
2. Select a Research Article: Choose a recent, peer-reviewed article on Ayurgenomics, ensuring its credibility and relevance- 1 hr.
3. Read and Analyse the Article: Identify the study objectives, methods, results, and statistical analysis. Evaluate the integration of Ayurvedic and genomic data- 2 hrs.
4. Critical Review: Highlight the strengths, limitations, and ethical considerations of the study- 2 hrs.
5. Prepare a Review Presentation: Summarize the article, create visual aids, and share personal insights about its impact on Ayurgenomics.- 1 hr
6. Present and Discuss: Present your review, encourage peer discussion, and answer questions about the article- 2 hrs.
7. Conclusion: Summarize the article's contributions to Ayurgenomics and suggest future research directions.

Practical Training 32.2 : Seminar presentation on medicinal herbs as free radical scavengers.

Total hours: 10

- I. Literature collection: 4 hrs
- II. Power point preparation- 2 hrs
- III. Presentation-1 hr
- IV. Class interaction- 1 hr
- V. Report preparation on list of medicinal herbs scientifically evaluated for free radical scavenging effect- 2 hrs

Seminar Structure should be as follows:

1. Introduction: Define free radicals and oxidative stress, and introduce free radical scavenging.
2. Medicinal Herbs Overview: List herbs with antioxidant properties. Describe each herb's botanical name, traditional uses, and active compounds.
3. Mechanisms of Action: Explain how these herbs neutralize free radicals and highlight key compounds.
4. Scientific Evidence: Summarize key studies demonstrating the effects of selected herbs, using visual aids for clarity.
5. Health Benefits: Discuss potential benefits, including anti-inflammatory effects and chronic disease prevention.
6. Practical Applications: Suggest ways to use these herbs in daily life and note safety considerations.

Conclusion: Recap key points and stress the need for further research.

References: List all sources cited in a clear format.

Experiential learning Activity

Experiential-Learning 32.1 : Concept proposal preparation for applying Pharmacogenomics to Siddha principles

Total hours: 10

1. Arrive objectives: Define main research goals, such as studying genetic factors in disease susceptibility and treatment responses- 2 hrs.
2. Methodology: Describe study design, participant criteria, data collection methods, and analysis techniques- 4 hrs
3. Expected Outcomes: Discuss potential findings and their implications for personalized Siddha treatments.- 3 hrs
4. Conclusion: Summarize the proposal's importance and potential impact- 1 hr

Experiential-Learning 32.2 : Group discussion on integrating Siddha principles with genomics

Total hours:10

1. Students should engage in reading, presenting, and critically appraising research papers on Ayurgenomics- 4 hrs
2. Paper presentations, group discussions, ethical debates, comparative analyses of multiple studies- 4 hrs.
3. Students should develop personalized Siddha treatment plans based on genomic data and explore the future of Siddha genomics in clinical practice- 2 hrs

Experiential-Learning 32.3 : Concept proposal preparation for applying Pharmacogenomics to Siddha principles

Total hours: 6

1. Literature collection on Siddha medicine and pharmacogenomics, Explain the significance of their integration-3 hrs.
2. Summarize existing research and identify gaps- 3 hrs

Modular Assessment

Assessment method

Conduct a Structured Modular Assessment. Assessment will be for 50 marks. Keep a Structured marking pattern. Use different Assessment methods in each Module for the semester. Keep a record of the structured pattern used for Assessment. Calculate the Modular Grade point as per table 6C.

Hour

4

Choose any of the below assessment for 50 marks.

A.Short Answer Questions: Four questions from Unit 1-3 (4x5=20 Marks)

B. Assignments- Students have to submit assignment on network pharmacology/ free radicals in disease and therapy/Pharmacogenomics- 30 Marks

Or

Any practical in converted form can be taken for assessment-25 Marks

And

Any of the experiential as portfolio/ reflections / presentations can be taken as assessment-25 Marks

Table 4 : Practical Training Activity

(*Refer table 3 of similar activity number)		
Practical No*	Practical name	Hours
1.1	Ethnobotany	10
1.2	Biodiversity Quadrat Analysis	10
2.1	Pharmacognostical Evaluation of Herbal raw drugs	8
2.2	Pharmacognostical evaluation of Herbal raw drugs	6
2.3	Gradation of Herbal drugs	6
3.1	Microscopic Techniques	4
3.2	Plant Histology	4
3.3	Microscopical Sectioning of Herbal drugs	6

3.4	Powder Drug Analysis	6
4.1	Adulteration and Substitution of herbal drugs	4
4.2	Plant Identification	8
4.3	Authentication of Herbal drugs	8
5.1	Structural Analysis of Herbal drugs	8
5.2	Phytochemical Analysis of Herbal drugs	8
5.3	Determination of Purity of Herbal Drugs	4
6.1	Phytochemical Analysis - Alkaloid	4
6.2	Phytochemical Analysis - Glycosides	4
6.3	Phytochemical Analysis - Tannins	4
6.4	Phytochemical Analysis -Flavonoids	4
6.5	Phytochemical Analysis - Phytosterols	4
7.1	Anti-oxidant Herbs	4
7.2	Herbs for Gastrointestinal (GI) disorders	4
7.3	Herbs for Respiratory Health	4
7.4	Antimicrobial herbal drugs	5
7.5	Poisonous herbs and their Antidote plants	3
8.1	Herbal Cosmetics - Hair	6
8.2	Herbal Facials	6
8.3	Herbal Cosmetics - Soap, Mouth wash and Oral cream	8

9.1	Preparation of Mooligai Karpam and Phytochemical analysis	4
9.2	Significance of nomenclature.	4
9.3	Phytochemical analysis	4
9.4	Thin Layer chromatography	4
9.5	Preparation of Mooligai Sarakku Vaippu and Mooligai Uppu	4
10.1	Single herb Preparation for the listed medicinal herbs	3
10.2	DNA barcoding analysis	4
10.3	Organoleptic and phytochemical evaluation.	3
10.4	Phytochemical mapping.	6
10.5	Phytochemical analysis, authentication, distribution, pharmacology and therapeutic uses.	4
11.1	Purification techniques for herbal raw materials.	3
11.2	Purification methods of given metals, minerals and animal products using herbs	4
11.3	Instrumental analysis on Herbal raw drug/ herbal before and after purification process	4
11.4	Preparation of Higher order medicines using single herb.	4
11.5	Identification of the plants, botanically and chemically as per published monograph	5
12.1	Exhibition of Anti-inflammatory invivo procedure through acute inflammation method	4
12.2	Preparation of single-herb topical formulation.	3
12.3	Herbal medicine preparation for NCD and Sports & marital art injuries.	5
12.4	Preparation of single drug medication for Thoal noigal.	4
12.5	Egamooligai Prayogam for Ophthalmic diseases and Ear, Nose and Throat diseases	4

13.1	Determination of the Physicochemical Parameters of Chooranam	4
13.2	Determination of physicochemical parameters of plant derived products.	5
13.3	Practicals on quantitative estimation of phytochemicals	4
13.4	Plant identification by Thin Layer Chromatography.	3
13.5	Identification of Aflatoxins by TLC (FSSAI Method).	4
14.1	Phytopharmaceutical extraction.	4
14.2	Extraction of phytoconstituents.	4
14.3	Conventional and chromatographic separation techniques.	4
14.4	Identification of phytochemicals by UV absorption spectra.	4
14.5	Usage of chem Draw and Docking software.	4
15.1	Formulation of innovative food items	4
15.2	Calorific value of traditional sweets/Candied Fruits	4
15.3	Antioxidant assay of Herbal foods.	2
15.4	Proximate analysis of Siddha Nutraceuticals.	4
15.5	Glycemic index (GI) analysis	6
16.1	Preparation of pigments / dyes / flavors / sweeteners derived from plants	4
16.2	Extraction of Bio implant from plants.	4
16.3	Preparation and nanoparticle characterization of Mooligai parpam	4
16.4	Preparation of Plant-based collagen for any cosmetic purpose.	4
16.5	Experimentation of basic plant tissue culture.	4

17.1	Pharmacopoeial Identification Tests	8
17.2	Pharmacopoeial Identification Tests	8
17.3	Pharmacopoeial Identification Tests	4
18.1	Examination of Minerals / Metal ore - Physical	10
18.2	Chemical Analysis of Metal and Mineral Ore	10
19.1	Limit Tests for Presence of Heavy Metals in Parpam	8
19.2	Limit Tests for Presence of Heavy Metals in Chendooram	8
19.3	Limit tests for presence of heavy metals in Chunnam	4
20.1	Extraction of Sembu from Poonaagam	10
20.2	Extraction of Sembu from Indirakoba Poochi	10
21.1	Various purification methods - Sembu	5
21.2	Extraction of Karuvangam (Lead) from Mirutharsingi	2
21.3	Various purification methods – Velli, Naagam	3
21.4	Purification of Velvangam and Karuvangam	5
21.5	Vaippu muraikal - Veeram, Rasa karpooram, Lingam	2
21.6	Various purification Techniques – Rasam, Veeram, Pooram, Lingam	3
22.1	Perform Vaippu muraikal - Nelikai Gandhi vaippu	2
22.2	Various purification Techniques- Gandhagam, Anjanakal	2
22.3	Various purification Techniques of Paadanangal - Gowri paadanam, Vellai paadanam, Thalagam, Manosilai, Kuthiraipal paadanam	2
22.4	Vaippu muraikkal - Gowri paadanam, Vellai paadanam, Thalagam, Manosilai and Kuthiraipal paadanam.	2

22.5	Experiments - Invitro muscle contraction and relaxation experiments using drugs that contains sodium, potassium and calcium	1
22.6	Vaippu muraikal (Navatcharam, Padikaram, Pachai karpooram, Venkaram)	2
22.7	Extraction of Yavaatchaaram- Potassium Carbonate from ashes of Yava gothumai (Type of wheat)	2
22.8	Test for assessing acidity and basicity of Siddha drugs Litmus paper test Phenolphthelin test Methyl orange test Determination of PH using PH meter	1
22.9	Vaippu muraikal - Indhuppu	2
22.10	Various purification Techniques – Vediuppu ,Pooneru Thetchai	2
22.11	Perform test for assessing acidity and basicity of any Karasaaram Litmus paper test Phenolphthelin test Methyl orange test Determination of PH using PH meter	2
23.1	Vaippu muraikal - Kadikaaram, Thurusu and Paalthutham	5
23.2	Various purification Techniques - Abragam, , Karpoorasilasathu, Kalnar, Thurusu, Palthutham	10
23.3	Various purification Techniques - Muthu, Pavalam,	5
24.1	Analysis of Milk	9
24.2	Analysis of Curd	2
24.3	Analysis of Ghee for Purity	4
24.4	Analysis of Honey and Bees Wax	5
25.1	Identification of Novel drug delivery dosage forms	1
25.2	Experimental and clinical data related Pharmacokinetics of drugs using software	3
25.3	Identification of transduction mechanism of receptors using models (Physical/digital)	8
25.4	1.Dose response curve (DRC) plotting for pD2 value for acetylcholine on frog rectus abdominis muscle using simulated experiments using Ex pharm software. 2. Identification of synergistic and antagonistic actions of drugs using charts	8
26.1	Clinical signs of toxicity identification in experimental animals using videoclips/charts	2

26.2	Handling, sexing and various routes of drug administration in experimental animals	10
26.3	Concept proposal preparation for the conduct of clinical trial during pandemic	8
27.1	Screening of drugs for CNS disorders using animal models/simulated experiment	10
27.2	Screening of Diuretics using Lipschitz test/Simulated experiment	5
27.3	Screening of Anti-asthmatics using animal model/Simulated experiment	5
28.1	Effect of drugs acting on ANS using animal/Simulated experiment	8
28.2	Screening of anti-hypertensive drugs using Simulated experiment	4
28.3	Group discussion on in vitro techniques for drug screening.	8
29.1	Demonstration of anti ulcer activity of drugs using animal model/Simulated experiment	10
29.2	Screening of analgesic, anti-inflammatory activity of drugs using animal models or simulated experiment	10
30.1	Group discussion on mechanism based Screening of Type-2 Antidiabetic agents	10
30.2	Anti-bacterial activity of drugs through in vitro methods/simulated experiments.	10
31.1	Structured informed consent form (ICF) preparation	10
31.2	Assignment on regulatory guidelines for the conduct of Clinical trial in Ayush drugs	10
32.1	Journal club review on research article on Ayurgenomics..	10
32.2	Seminar presentation on medicinal herbs as free radical scavengers.	10

Table 5 : Experiential learning Activity

(*Refer table 3 of similar activity number)		
Experiential learning No*	Experiential name	Hours
1.1	Ethnobotany	6
1.2	Traditional Medicines	6
1.3	Cross-Cultural study	6
1.4	Ethnopharmacology	4
1.5	Biodiversity Conservation of Medicinal plants	4
2.1	Medicinal plants in Allied Sciences	3
2.2	Herbal Drug Market	10
2.3	Bureau of Indian Standards for Herbal drugs	3
2.4	Export import and Trade of Herbal drugs	10
3.1	Microscope Handling	6
3.2	Microscopic Techniques in Herbal drugs	6
3.3	Anatomical Analysis of Herbal drugs	7
3.4	Powder Drug Analysis	7
4.1	Adulterants and Substitutes of Herbal drugs	8
4.2	Medicinal Plant Identification	6
4.3	Authentication of Medicinal Plants	4
4.4	Online Plant identification	4

4.5	Herbal drug Regulations	4
5.1	Structural Analysis of Herbal drugs	6
5.2	Analytical Standards	4
5.3	Quality Control and Evaluation of Herbal drugs	4
5.4	Heavy metal Analysis in Herbal Drugs	6
5.5	Botanical Reference Substance (BRS)	6
6.1	Functional group Analysis - Alkaloids	6
6.2	Functional group Analysis - Glycosides	6
6.3	Functional group Analysis - Tannins	6
6.4	Functional group Analysis - Flavonoids	4
6.5	Functional Group Analysis - Phytosterols	4
7.1	Anti-Oxidant Activity	6
7.2	Herbs for Gastrointestinal disorders	5
7.3	Herbs for Respiratory Health	5
7.4	Herbs for Anti-microbial action	5
7.5	Legal Regulations of Herbal Narcotic Drugs	5
8.1	Herbal Cosmetics	6
8.2	Herbal Cosmetics for Hair	6
8.3	Herbal Facials	5

8.4	Herbal Cosmetis - Product Development	4
8.5	Regulations of Herbal Cosmetics	5
9.1	Cultivation of Black herbs and Antioxidant activity of Karpa Mooligai	5
9.2	Collection of vernacular names.	4
9.3	Herbs for Poisonous Bites, Rituals & Attakarma.	5
9.4	Rationale and significance of Thogai sarakkugal	4
9.5	Mooligai Sarakku Vaippu muraigal and Mooligai Uppu seimuraigal	8
10.1	Single herbal remedies	6
10.2	Assignments/ seminar on DNA barcoding methods	6
10.3	Collection of Exudates and Galls.	6
10.4	Phytoconstituents, recent research advances, Formulations	2
10.5	Therapeutic value of Global medicinal plants.	6
11.1	Collection of various purification methods and its significance.	4
11.2	Comparison of analytical changes in metals/mineral/animal products before and after purification using herbal extracts.	5
11.3	Industrial Techniques for Herbal Purification and equipment	5
11.4	Scientific rationale of the herbs used in the preparation of higher order medicines	6
11.5	Collection of plant monographs from texts, journals, etc...	6
12.1	Documentation of anti-cancer activity procedures and herbs used in veterinary practices	5
12.2	Meta-analysis of in-vivo and in-vitro hepatoprotective activity	4
12.3	Literature review of medicinal plants used for NCD and Sports & marital art injuries	6

12.4	Literature Review on Single Herbal medications for Skin Diseases	5
12.5	Literature review of Medicinal plants used for Opthal and ENT	6
13.1	Instrumental analysis in Drug Testing Lab.	6
13.2	Different methods of extraction of vegetable oil, purification processing methods	4
13.3	Preparation of chart on phytochemicals	5
13.4	Preparation of test report on TLC	5
13.5	Methods of testing the microbial load of plants	6
14.1	Compilation of Monographs for a Phytopharmaceutical	4
14.2	Visualization of Herbal extraction	6
14.3	Field visit to an HPLC instrument in a Quality Control (QC) or Research Laboratory.	6
14.4	Field visit to an GC-MS (Gas Chromatography-Mass Spectrometry) instrument analysing lab	6
14.5	Compilation of research articles on docking studies	4
15.1	Collection of Siddha dietary data for lifestyle disorders at NFL visit	6
15.2	Medicinal properties of Unavagum Thavarangal	4
15.3	Food Analysis Lab Visit	5
15.4	Life style disorders and millet diet	5
15.5	Collection of medicinal values of Parambariya nel (traditional paddy) varieties	6
16.1	Educational visit to agricultural plantations and a manufacturing unit	6
16.2	Data collection of Phytoexosomes and its scope in the field of Biomedicine and Biotechnology and Antimicrobial assay of Chitosan.	6

16.3	Application of green nano materials in water purification.	4
16.4	Exploring Collagen in the Cosmetic Industry.	6
16.5	Exploration of Plant tissue culture principles, methods and applications.	4
17.1	Hands on Training Instrumental Analytical Techniques for Metal and Mineral Drugs	10
17.2	Hands on Training on Instrumental Analytical Techniques for Metal and Mineral Drugs	8
17.3	Hands on Training on Instrumental Analytical Techniques for Metal and Mineral drugs	7
17.4	Hands on Training on Instrumental Analytical Techniques for Metal and Mineral drugs	1
18.1	Metal and Mineral Ore Collection	10
18.2	Physical Examination of Collected Metal/Mineral ore	6
18.3	Chemical Analysis of Collected ores	10
19.1	Centres for Cellular and Molecular Biology, Institutes of Toxicological research	10
19.2	Pharmacovigilance Practices	8
19.3	Safety Assessment of Siddha Medications of Metal and Mineral Origin.	8
20.1	Standardization of Siddha drugs of metals and mineral origin	10
20.2	Observation of Strategies used in Drug discovery and Development Process.	8
20.3	In-Silico Screening of Drugs of Metal / Mineral / Organometallic origin.	4
20.4	Analysis for the Presence of Nanometals in Herbs mentioned as Uloga sathulla mooligaigal.	4
21.1	Meta analysis- publish research articles	1
21.2	Meta analysis- publish research articles	1
21.3	Identify the testing method of purified Kaantham	1

21.4	Assignment on History of Panchasootham	1
21.5	Meta analysis- publish research articles	3
21.6	Publication of mercurial compound- veeram, pooram	3
21.7	Publication- mercurial compounds	4
21.8	Field visit- National Metallurgic Laboratory, Central Drug Research Institute, Geological Survey of India, Institute of Minerals and Material Technology	7
21.9	Extraction Procedure- Metallic ore (Panchasootham)	5
22.1	Biological role - ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	2
22.2	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1
22.3	Meta analysis Research article publication	4
22.4	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	2
22.5	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1
22.6	Perform Meta-analysis - Arsenic and its compounds	4
22.7	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	1
22.8	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics	3
22.9	Perform Meta-analysis - publish research article	5
22.10	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparision of Siddha and modern drugs	1
22.11	Biological roles, ADME, Mechanism of action activity on enzyme, Target organs, Toxicokinetics comparision of Siddha and modern drugs	2
23.1	Assessment of teaching ability	2
23.2	Traditional preparation method - Karchunnambu	2

23.3	Geological ore collection of Abragam and Karchunam, Kavikal, Silasathu	10
23.4	Purification of collected ores Abragam, Karchunnam, Kavikal, Silasathu	4
23.5	Current trends and recent research updates	8
24.1	Adulteration in edible Animal By-Products	6
24.2	Field visit - Food analysis laboratory	10
24.3	Field visit -Central Salt and Marine Chemical Research Institute	10
25.1	Seminar presentation on Strategies and Perspectives of Pharmacokinetic Profiling of AYUSH Drugs using case studies	6
25.2	Group Discussion on Pharmacovigilance Center functions	10
25.3	ADR analysis of Siddha formulations	10
26.1	Protocol preparation and case study presentation of acute toxicity studies of Siddha formulation as per OECD guidelines	6
26.2	Protocol preparation for repeated dose toxicity study of Siddha formulation as per OECD guidelines and mock presentation to Institutional Animal Ethics Committee (IAEC)	10
26.3	Assignment submission on anaesthesia protocol in experimental animals and Group discussion	10
27.1	Data collection on common CNS disorders treated with Siddha therapy using hospital records.	10
27.2	Screening of anti-epileptics and anti-depressants	6
27.3	Report submission and group discussion on mechanism based screening methods of anti-parkinson drugs.	10
28.1	Literature review on Siddha formulations and medicinal herbs for cardiovascular complications	6
28.2	Journal club presentation to critically review research articles	10
28.3	Awareness creation for Siddha way of life style and Diet for cardiovascular complications	10
29.1	Drug Identification & Classification Workshop on NSAIDs and Anti-Ulcer Drugs:	8

29.2	Assignment on integrated Siddha and modern treatment approaches for Rheumatoid Arthritis (RA).and interactive discussion	8
29.3	Group discussion on anti-ulcer formulations in Siddha medicine and their scientific validation.	10
30.1	Field Visit to R&D institutes/Labs to learn screening methods of anti-viral drugs	10
30.2	Field Visit to R&D institutes/Labs to learn screening methods of anti-cancer drugs	10
30.3	Assignment on propylactic traditional medicines tried during COVID pandemic	6
31.1	Protocol preparation for the conduct of Phase III clinical trial of Siddha formulation	10
31.2	Prepare a list of essential medicine for a health care facility	6
31.3	Protocol preparation for conducting Phase II clinical trial of a Siddha formulation .	10
32.1	Concept proposal preparation for applying Pharmacogenomics to Siddha principles	10
32.2	Group discussion on integrating Siddha principles with genomics	10
32.3	Concept proposal preparation for applying Pharmacogenomics to Siddha principles	6

Table 6 : Assessment Summary: Assessment is subdivided in A to H points**6 A : Number of Papers and Marks Distribution**

Subject Code	Paper	Theory	Practical	Total
SIDPG- GM	4	100 x 4 Papers = 400	400	800

6 B : Scheme of Assessment (Formative and Summative Assessment)**Credit frame work**

SIDPG- GM consists of 32 modules totaling 64 credits, which correspond to 1920 Notional Learning Hours. Each credit comprises 30 Hours of learner engagement, distributed across teaching, practical, and experiential learning in the ratio of 1:2:3. Accordingly, one credit includes 5 hours of teaching, 10 hours of practical training, 13 hours of experiential learning, and 2 hours allocated for modular assessment, which carries 25 marks.

Formative Assessment :Module wise Assessment:will be done at the end of each module. Evaluation includes learners active participation to get Credits and Marks. Each Module may contain one or more credits.

Summative Assessment:Summative Assessment (University examination) will be carried out at the end of Semester VI.

6 C : Calculation Method for Modular Grade Points (MGP)

Module Number & Name (a)	Credits (b)	Actual No. of Notional Learning Hours (c)	Attended Number of notional Learning hours (d)	Maximum Marks of assessment of modules (e)	Obtained Marks per module (f)	MGP = $d \times \frac{f}{c \times e} \times 100$
Semester No : 3						
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)						
M1 Basics of Pharmacognosy	2	60		50		
M2 Herbal Raw Materials	2	60		50		
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbs including Phytopharmacology)						
M9 Mooligai Marunthariviyal (Phytopharmacology)	2	60		50		
M10 Gunapadam Mooligai Iyal (Siddha Herbal Pharmacology)	2	60		50		
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)						
M17 Essentials of inorganic chemistry and analytical chemistry	2	60		50		
M18 Medical Mineralogy and Geology	2	60		50		

Paper No : 4 (Essentials of Pharmacology)						
M25 General Pharmacology	2	60		50		
M26 Drug Development Process	2	60		50		
	16	480		400		
Semester No : 4						
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)						
M3 Plant Anatomy and Powdered drug analysis	2	60		50		
M4 Drug Authentication and Regulations	2	60		50		
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology)						
M11 Purification Methods of Herbal Raw drugs, Preparation of Higher-Order Medicines and Monographic Studies of Medicinal Plants	2	60		50		
M12 Mooligai Maruthuva Payanpadugal (Therapeutic Applications of Medicinal Plants)	2	60		50		
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)						
M19 Safety Pharmacology of Metals and Mineral Drugs	2	60		50		
M20 Recent advances including applied pharmaceuticals	2	60		50		
Paper No : 4 (Essentials of Pharmacology)						
M27 Systemic Pharmacology and Screening methods of Central Nervous System(CNS), Respiratory and Renal Drugs	2	60		50		
M28 Systemic Pharmacology and Screening methods of Autonomic Nervous System (ANS) and Cardiovascular System (CVS) Drugs	2	60		50		
	16	480		400		
Semester No : 5						
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)						
M5 Pharmacopoeial Standards of Herbal drugs	2	60		50		
M6 Phytochemistry	2	60		50		

Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbs including Phytopharmacology)						
M13 Analytical standardization of herbal drugs	2	60		50		
M14 Phytochemicals / Phytopharmaceuticals, Chromatographic techniques for isolation and Bioinformatics	2	60		50		
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)						
M21 Ulogangal and Panchasootham (Metals and Mercurial Compounds)	2	60		50		
M22 Paadanankal and Karasaram (Arsenic Compounds and Salts, Alkalies)	2	60		50		
Paper No : 4 (Essentials of Pharmacology)						
M29 Systemic Pharmacology and Screening methods of Autacoids and Gastrointestinal Tract(GIT) Drugs	2	60		50		
M30 Systemic Pharmacology and Screening methods of Drugs acting on Hormones and blood forming agents	2	60		50		
	16	480		400		
Semester No : 6						
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)						
M7 Study of Herbal drugs based on therapeutic action for selective systems of the body	2	60		50		
M8 Herbal Cosmetics	2	60		50		
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbs including Phytopharmacology)						
M15 Herbs used in Siddha Dietetics	2	60		50		
M16 Recent Trends in Plant Based Applications, Drugs and Cosmetics Act and Magic Remedies Act	2	60		50		
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)						
M23 Uparasam and Navamanikal (Mineral substance and Gems) Jeeva Vaguppu – Part I (Drugs of Marine origin and Animal by products)	2	60		50		
M24 Jeeva Vaguppu Part - II (Drugs of Marine Origin and Animal by Products)	2	60		50		

Paper No : 4 (Essentials of Pharmacology)						
M31 Anti-microbials and Clinical Pharmacology	2	60		50		
M32 Recent advances in Pharmacology	2	60		50		
	16	480		400		
MGP = ((Number of Notional learning hours attended in a module) X (Marks obtained in the modular assessment) / (Total number of Notional learning hours in the module) X (Maximum marks of the module)) X 100						

6 D : Semester Evaluation Methods for Semester Grade Point Average (SGPA)

SGPA will be calculated at the end of the semester as an average of all Module MGPs. Average of MGPs of the Semester For becoming eligible for Summative assessment of the semester, student should get minimum of 60% of SGPA

SGPA = Average of MGP of all modules of all papers = add all MGPs in the semester/ no. of modules in the semester
Evaluation Methods for Modular Assessment

Semester No : 3		
Paper No : 1 Medicinal Botany and Phytopharmacognosy		
A S.N o	B Module number and Name	C MGP
1	M1.Basics of Pharmacognosy	C1
2	M2.Herbal Raw Materials	C2
Paper No : 2 Gunapadam Mooligai - Materia Medica of Herbs including Phytopharmacology		
A S.N o	B Module number and Name	C MGP
3	M9.Mooligai Marunthariviyal (Phytopharmacology)	C3
4	M10.Gunapadam Mooligai Iyal (Siddha Herbal Pharmacology)	C4
Paper No : 3 Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin		
A S.N o	B Module number and Name	C MGP
5	M17.Essentials of inorganic chemistry and analytical chemistry	C5
6	M18. Medical Mineralogy and Geology	C6
Paper No : 4 Essentials of Pharmacology		
A S.N o	B Module number and Name	C MGP
7	M25.General Pharmacology	C7
8	M26.Drug Development Process	C8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 4		
Paper No : 1 Medicinal Botany and Phytopharmacognosy		
A	B	C

S.No	Module number and Name	MGP
1	M3.Plant Anatomy and Powdered drug analysis	C1
2	M4.Drug Authentication and Regulations	C2
Paper No : 2 Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology		
A S.No	B Module number and Name	C MGP
3	M11.Purification Methods of Herbal Raw drugs, Preparation of Higher-Order Medicines and Monographic Studies of Medicinal Plants	C3
4	M12.Mooligai Maruthuva Payanpadugal (Therapeutic Applications of Medicinal Plants)	C4
Paper No : 3 Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin		
A S.No	B Module number and Name	C MGP
5	M19.Safety Pharmacology of Metals and Mineral Drugs	C5
6	M20.Recent advances including applied pharmaceutics	C6
Paper No : 4 Essentials of Pharmacology		
A S.No	B Module number and Name	C MGP
7	M27.Systemic Pharmacology and Screening methods of Central Nervous System(CNS), Respiratory and Renal Drugs	C7
8	M28.Systemic Pharmacology and Screening methods of Autonomic Nervous System (ANS) and Cardiovascular System (CVS) Drugs	C8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 5		
Paper No : 1 Medicinal Botany and Phytopharmacognosy		
A S.No	B Module number and Name	C MGP
1	M5.Pharmacopoeial Standards of Herbal drugs	C1
2	M6.Phytochemistry	C2
Paper No : 2 Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology		
A	B	C

S.N o	Module number and Name	MGP
3	M13.Analytical standardization of herbal drugs	C3
4	M14.Phytochemicals / Phytopharmaceuticals, Chromatographic techniques for isolation and Bioinformatics	C4
Paper No : 3 Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin		
A S.N o	B Module number and Name	C MGP
5	M21.Ulogangal and Panchasootham (Metals and Mercurial Compounds)	C5
6	M22.Paadanankal and Karasaram (Arsenic Compounds and Salts,Alkalies)	C6
Paper No : 4 Essentials of Pharmacology		
A S.N o	B Module number and Name	C MGP
7	M29.Systemic Pharmacology and Screening methods of Autacoids and Gastrointestinal Tract(GIT) Drugs	C7
8	M30.Systemic Pharmacology and Screening methods of Drugs acting on Hormones and blood forming agents	C8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 6		
Paper No : 1 Medicinal Botany and Phytopharmacognosy		
A S.N o	B Module number and Name	C MGP
1	M7.Study of Herbal drugs based on therapeutic action for selective systems of the body	C1
2	M8.Herbal Cosmetics	C2
Paper No : 2 Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology		
A S.N o	B Module number and Name	C MGP
3	M15.Herbs used in Siddha Dietetics	C3
4	M16.Recent Trends in Plant Based Applications, Drugs and Cosmetics Act and Magic Remedies Act	C4
Paper No : 3 Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin		

A S.No	B Module number and Name	C MGP
5	M23.Uparasam and Navamanikal (Mineral substance and Gems) Jeeva Vaguppu – Part I (Drugs of Marine origin and Animal by products)	C5
6	M24.Jeeva Vaguppu Part - II (Drugs of Marine Origin and Animal by Products)	C6

Paper No : 4 Essentials of Pharmacology

A S.No	B Module number and Name	C MGP
7	M31.Anti-microbials and Clinical Pharmacology	C7
8	M32.Recent advances in Pharmacology	C8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)

S. No	Evaluation Methods
1.	Method explained in the Assessment of the module or similar to the objectives of the module.

6 E : Question Paper Pattern

**MD/MS SIDDHA Examination
SIDPG- GM
Sem VI**

Time: 3 Hours ,**Maximum Marks:** 100
INSTRUCTIONS: All questions compulsory

		Number of Questions	Marks per Question	Total Marks
Q 1	Application-based Questions (ABQ)	1	20	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Analytical based structured Long answer question (LAQ)	4	10	40
				100

6 F : Distribution for summative assessment (University examination)

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 1 (Medicinal Botany and Phytopharmacognosy)				
(M-1)Basics of Pharmacognosy (Marks: Range 5-15)				
1	(U-1) Introduction	No	Yes	No
2	(U-2) Traditional Medicines	No	Yes	No
3	(U-3) Ethno-Botany	No	Yes	Yes
4	(U-4) Ethnopharmacology	No	Yes	Yes
5	(U-5) Conservation of Medicinal plants	No	Yes	Yes
(M-2)Herbal Raw Materials (Marks: Range 5-20)				
1	(U-1) Root, Rhizome, Stem, Wood and Bark drugs	Yes	Yes	Yes
2	(U-2) Leaf, Flower, Fruit and Seed Drugs	Yes	Yes	Yes
3	(U-3) Herbal Market and Geographical Indication (GI) of herbal drugs	No	Yes	Yes
4	(U-4) Bureau of Indian Standards (BIS) for Herbal drugs	No	Yes	No
5	(U-5) Trade and Commerce in Herbal drugs	No	Yes	No
(M-3)Plant Anatomy and Powdered drug analysis (Marks: Range 5-15)				
1	(U-1) Microscopy	No	Yes	No
2	(U-2) Plant Histology	No	Yes	No
3	(U-3) Microscopical Sectioning	No	Yes	Yes
4	(U-4) Anatomical Analysis of Herbal drugs	No	Yes	No
5	(U-5) Powdered Drug Analysis	No	Yes	No
(M-4)Drug Authentication and Regulations (Marks: Range 5-20)				
1	(U-1) Adulteration and Substitution	No	Yes	Yes
2	(U-2) Plant Identification	Yes	Yes	No
3	(U-3) Medicinal plant databases	No	Yes	No
4	(U-4) Authentication with Herbaria and Floras	No	Yes	No
5	(U-5) Herbal Drug Regulations	No	Yes	No
(M-5)Pharmacopoeial Standards of Herbal drugs (Marks: Range 5-15)				
1	(U-1) Structural Standards	No	Yes	No
2	(U-2) Analytical Standards	No	Yes	No
3	(U-3) Quality Assurance of Herbal drugs	No	Yes	No

4	(U-4) WHO guidelines for various contaminants in herbal drugs	No	Yes	No
5	(U-5) Botanical Standards	No	Yes	No
(M-6)Phytochemistry (Marks: Range 5-15)				
1	(U-1) Alkaloids	No	Yes	Yes
2	(U-2) Glycosides	No	Yes	Yes
3	(U-3) Tannins	No	Yes	Yes
4	(U-4) Flavonoids	No	Yes	Yes
5	(U-5) Phytosterols	No	Yes	Yes
(M-7)Study of Herbal drugs based on therapeutic action for selective systems of the body (Marks: Range 5-20)				
1	(U-1) Rejuvenating herbs	Yes	Yes	Yes
2	(U-2) Herbal drugs acting on Gastrointestinal tract and Endocrine system	Yes	Yes	Yes
3	(U-3) Herbal drugs acting on Respiratory system	Yes	Yes	Yes
4	(U-4) Anti-Cancer and Anti-microbial herbal drugs	Yes	Yes	Yes
5	(U-5) Poisonous and Narcotic plant drugs	Yes	Yes	Yes
(M-8)Herbal Cosmetics (Marks: Range 5-20)				
1	(U-1) Introduction	No	Yes	No
2	(U-2) Herbal Hair tonics	Yes	Yes	Yes
3	(U-3) Herbs for Face and Skin	Yes	Yes	Yes
4	(U-4) Product Development of Herbal Cosmetics	No	Yes	Yes
5	(U-5) Regulation in Herbal Cosmetics	No	Yes	Yes

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 2 (Gunapadam Mooligai - Materia Medica of Herbals including Phytopharmacology)				
(M-9)Mooligai Marunthariviyal (Phytopharmacology) (Marks: Range 5-20)				
1	(U-1) Kayakarpa Mooligaikal (Rejuvenating plants)	Yes	Yes	Yes
2	(U-2) Mooligaikalin Veru Peyargalum Peyarkaranamum (Synonyms and their meanings)	No	Yes	No
3	(U-3) Herbs with Unique Properties	No	Yes	Yes
4	(U-4) Thogai Sarakkugal (Classified Group of raw drugs/ herbs)	No	Yes	No
5	(U-5) Vaippu Sarakku Muraigal (prepared substitutes for natural substance by synthetic method) and Mooligai Uppu Seimuraigal (Salts derived from the ashes of the medicinal plants)	No	Yes	Yes
(M-10)Gunapadam Mooligai Iyal (Siddha Herbal Pharmacology) (Marks: Range 5-20)				
1	(U-1) Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Herbs	Yes	Yes	Yes
2	(U-2) Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Creepers, Climbers and Shrubs	Yes	Yes	Yes
3	(U-3) Gunapadam aspects and Recent advances in Pharmacognosy, Phytochemistry and Pharmacology in Important Medicinal Trees	Yes	Yes	Yes
4	(U-4) Gunapadam aspects and recent advances in pharmacognosy, phytochemistry and pharmacology across significant wild and domesticated medicinal plants	No	Yes	Yes
5	(U-5) Pharmacological and Therapeutic Insights into Global Medicinal Plants	Yes	Yes	Yes
(M-11)Purification Methods of Herbal Raw drugs, Preparation of Higher-Order Medicines and Monographic Studies of Medicinal Plants (Marks: Range 5-20)				
1	(U-1) Sutthi Muraigalin Mukkiyathuvam (Significance of Purification)	Yes	Yes	Yes
2	(U-2) Thathu Mattrum Jeeva Porutkalai Sutthi Seiya Payanpadum Mooligaikal	Yes	Yes	Yes
3	(U-3) Industrial Techniques and Equipment for Herbal Purification	No	Yes	Yes
4	(U-4) Mooligaikal (Herbals) used for preparing Higher-order Medicines	Yes	Yes	Yes

5	(U-5) Monographs of Medicinal Plants	No	Yes	Yes
(M-12)Mooligai Maruthuva Payanpadugal (Therapeutic Applications of Medicinal Plants) (Marks: Range 5-20)				
1	(U-1) Mode of Action and Pharmacological Profile of Herbals	Yes	Yes	Yes
2	(U-2) The Pharmacological Potential of Herbs in Different Physiological Systems	Yes	Yes	Yes
3	(U-3) Herbo-medical management for Specific diseases and injuries	Yes	Yes	Yes
4	(U-4) Herbals used in the treatment of Thoal noigal (Skin diseases)	Yes	Yes	Yes
5	(U-5) Therapeutic Applications of Herbal Medicines in Ophthalmology and ENT	Yes	Yes	Yes
(M-13)Analytical standardization of herbal drugs (Marks: Range 5-20)				
1	(U-1) Physicochemical parameters of herbal powder/Chooranam	Yes	Yes	Yes
2	(U-2) Physicochemical parameters of plant derived additives oil/resin/sugar/jaggery/Gum	Yes	Yes	Yes
3	(U-3) Phytochemical assays	Yes	Yes	Yes
4	(U-4) Plant Identification Test through Instrumental analysis	No	Yes	Yes
5	(U-5) Shelf life study and Guidelines	Yes	Yes	Yes
(M-14)Phytochemicals / Phytopharmaceuticals, Chromatographic techniques for isolation and Bioinformatics (Marks: Range 5-20)				
1	(U-1) Essence of phytopharmaceuticals	Yes	Yes	Yes
2	(U-2) Extraction Techniques	No	Yes	Yes
3	(U-3) Separation methods	Yes	Yes	Yes
4	(U-4) Instrumental Techniques for Phytopharmaceutical characterization	Yes	Yes	Yes
5	(U-5) Computational Docking Techniques	Yes	Yes	Yes
(M-15)Herbs used in Siddha Dietetics (Marks: Range 5-20)				
1	(U-1) Food is medicine, Medicine is Food	No	Yes	Yes
2	(U-2) Unavagum thavarangal (Plants as food)	No	Yes	Yes
3	(U-3) Herbal food rich in Antioxidants	Yes	Yes	Yes
4	(U-4) Ootachathu Mooligai-Siddha Nutraceuticals	Yes	Yes	Yes
5	(U-5) Parambaria Nel (Paddy) and other alternative functional	No	Yes	Yes

	grains			
(M-16)Recent Trends in Plant Based Applications, Drugs and Cosmetics Act and Magic Remedies Act (Marks: Range 5-15)				
1	(U-1) Sustainable Approach to Pigments, Dyes, Flavors, Sweeteners derived from plants	No	Yes	Yes
2	(U-2) Application of Plant Extract in Biomaterials- Bio-implants, Bioplastics, Exosomes and Biofuels	No	Yes	Yes
3	(U-3) Plant Based Nanotechnology	No	Yes	Yes
4	(U-4) Plant Based Collagen and Biologics	No	Yes	Yes
5	(U-5) Importance and Applications of Tissue Culture	No	Yes	Yes

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 3 (Gunapadam Thathu & Jeevam - Materia Medica of Metals, Minerals and Animal Origin)				
(M-17)Essentials of inorganic chemistry and analytical chemistry (Marks: Range 5-15)				
1	(U-1) Essentials of inorganic chemistry and Basics of Siddha Alchemy	No	Yes	Yes
2	(U-2) Fundamentals of Analytical chemistry	No	Yes	Yes
3	(U-3) Analytical instrumentation for evaluation of metal and mineral drugs	No	Yes	Yes
(M-18) Medical Mineralogy and Geology (Marks: Range 5-10)				
1	(U-1) Mineralogy, Crystallography,Geology	No	Yes	No
2	(U-2) Examination of Metals / Minerals - Physical and Chemical	No	Yes	No
(M-19)Safety Pharmacology of Metals and Mineral Drugs (Marks: Range 5-15)				
1	(U-1) Molecular mechanism of metal toxicity, carcinogenicity	No	Yes	Yes
2	(U-2) Mutagenicity, Genotoxicity, Ecotoxicity and Metal interaction	No	Yes	Yes
3	(U-3) Assessment of Safety Pharmacology of metal and mineral	No	Yes	Yes
(M-20)Recent advances including applied pharmaceuticals (Marks: Range 5-15)				
1	(U-1) Dosage forms, Delivery system and delivery route including Novel drug delivery system	No	Yes	Yes
2	(U-2) Drug Standardization, Drug Discovery and development	No	Yes	Yes
3	(U-3) Current trends in Metallo-therapeutics	No	Yes	Yes
4	(U-4) Pharmacogenomics and Nano pharmacology and other emerging technologies in pharmacology	No	Yes	Yes
(M-21)Ulogangal and Panchasootham (Metals and Mercurial Compounds) (Marks: Range 5-20)				
1	(U-1) Transitional Metals - Ayam - Iron, Sembu- Copper, Nagam - Zinc, Velli - Silver and Thangam - Gold	Yes	Yes	Yes
2	(U-2) Post Transitional Metals - Vangam - Lead, Mirutharsingi - Galena sulphide, Velvangam - Tin	Yes	Yes	Yes
3	(U-3) Miscellaneous Metals - Ekku - Steel, Ayanagam - Iron Zinc Alloy, Mandooram - Iron Oxide, Kaantham - Magnetite	Yes	Yes	Yes
4	(U-4) Panchasootham- Mercury and Mercurial compounds	Yes	Yes	Yes
(M-22)Paadanankal and Karasaram (Arsenic Compounds and Salts,Alkalies) (Marks: Range 5-15)				

1	(U-1) Gandhagam (Sulphur), Anjanakal (Antimony)	No	Yes	Yes
2	(U-2) Gowri paadanam (Arsenic compound), Vellai paadanam (Arsenium Acidum), Thalagam (Arsenic Tri Sulphidum), Manosilai (Arsenic Di Sulphidum), Kuthiraipal paadanam (Feldspar)	No	Yes	Yes
3	(U-3) Alkaline metals and alkaline earth materials	No	Yes	Yes
4	(U-4) Karasaram- salts and alkalies	No	Yes	Yes
5	(U-5) Uppukal (Salts)	No	Yes	Yes
(M-23) Uparasam and Navamanikal (Mineral substance and Gems) Jeeva Vaguppu – Part I (Drugs of Marine origin and Animal by products) (Marks: Range 5-15)				
1	(U-1) Uparasam	No	Yes	Yes
2	(U-2) Navamanikal (Gems)	No	Yes	Yes
3	(U-3) Jeeva Vaguppu Part - I	No	Yes	Yes
(M-24) Jeeva Vaguppu Part - II (Drugs of Marine Origin and Animal by Products) (Marks: Range 5-20)				
1	(U-1) Introduction to Biology, Nomenclature, Taxonomy	Yes	Yes	Yes
2	(U-2) Marine Medicinal Chemistry	Yes	Yes	Yes
3	(U-3) Evaluation And Analysis Of Animal By-Products	Yes	Yes	Yes
4	(U-4) Jeeva vaguppu part – II	Yes	Yes	Yes

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 4 (Essentials of Pharmacology)				
(M-25)General Pharmacology (Marks: Range 5-20)				
1	(U-1) Introduction to Pharmacology	No	Yes	Yes
2	(U-2) Pharmacokinetics	Yes	Yes	Yes
3	(U-3) Pharmacodynamics	No	Yes	Yes
4	(U-4) Adverse drug effects	No	Yes	Yes
(M-26)Drug Development Process (Marks: Range 5-20)				
1	(U-1) Methods of Drug discovery	No	Yes	Yes
2	(U-2) Reverse Pharmacology	Yes	Yes	Yes
3	(U-3) Experimental animals in Preclinical research	Yes	Yes	Yes
4	(U-4) Drug development during Pandemic	No	Yes	Yes
(M-27)Systemic Pharmacology and Screening methods of Central Nervous System(CNS), Respiratory and Renal Drugs (Marks: Range 5-20)				
1	(U-1) Drugs acting on Central nervous system	No	Yes	Yes
2	(U-2) Preclinical Screening	Yes	Yes	Yes
3	(U-3) Drugs acting on Kidney and Respiratory System	No	Yes	Yes
4	(U-4) Preclinical screening	No	Yes	Yes
(M-28)Systemic Pharmacology and Screening methods of Autonomic Nervous System (ANS) and Cardiovascular System (CVS) Drugs (Marks: Range 5-20)				
1	(U-1) Autonomic Nervous System	No	Yes	Yes
2	(U-2) Cardiovascular Drugs	Yes	Yes	Yes
3	(U-3) Preclinical Screening	No	Yes	Yes
4	(U-4) In vitro experimentation	No	Yes	Yes
(M-29)Systemic Pharmacology and Screening methods of Autacoids and Gastrointestinal Tract(GIT) Drugs (Marks: Range 5-20)				
1	(U-1) Gastrointestinal System	Yes	Yes	Yes
2	(U-2) Preclinical screening	Yes	Yes	Yes
3	(U-3) Autacoids and Related drugs	No	Yes	Yes
(M-30)Systemic Pharmacology and Screening methods of Drugs acting on Hormones and blood forming agents (Marks: Range 5-20)				
1	(U-1) Drugs acting on Hormones	Yes	Yes	Yes

2	(U-2) Drugs affecting blood and blood formation	No	Yes	Yes
3	(U-3) Screening Methods	No	Yes	Yes
4	(U-4) Screening methods	Yes	Yes	Yes
(M-31)Anti-microbials and Clinical Pharmacology (Marks: Range 5-20)				
1	(U-1) General principles of antimicrobial therapy	No	Yes	Yes
2	(U-2) Clinical trials	Yes	Yes	Yes
3	(U-3) Drug regulatory requirements	No	Yes	Yes
(M-32)Recent advances in Pharmacology (Marks: Range 5-15)				
1	(U-1) Introduction to Network Pharmacology	No	Yes	Yes
2	(U-2) Pharmacogenomics	No	Yes	Yes
3	(U-3) Free radicals Pharmacology	No	Yes	Yes

6 G : Instruction for the paper setting & Blue Print for Summative assessment (University Examination)

Instructions for the paper setting.

1. University examination shall have 4 papers of 100 marks.

Each 100 marks question paper shall contain:-

- Application Based Question: 1 No (carries 20 marks)
- Short Answer Questions: 8 Nos (each question carries 05 marks)
- Long Answer Questions: 4 Nos (each question carries 10 marks)

2. Questions should be drawn based on the table 6F.

3. Marks assigned for the module in 6F should be considered as the maximum marks. No question shall be asked beyond the maximum marks.

4. Refer table 6F before setting the questions. Questions should not be framed on the particular unit if indicated “NO”.

5. There will be a single application-based question (ABQ) worth 20 marks. No other questions should be asked from the same module where the ABQ is framed.

6. Except the module on which ABQ is framed, at least one Short Answer Question should be framed from each module.

7. Long Answer Question should be analytical based structured questions assessing the higher cognitive ability.

8. Create Blueprint based on instructions 1 to 7

6 H : Distribution of Practical Exam (University Examination)

S.No	Heads	Marks
1	MAJOR PRACTICAL Total duration 3 hours (one question: Either from paper 1 or paper 2, or paper 3 or paper 4. Marks - (1 X 100 = 100 Marks) Instructions: Student should choose any one major practical by lot method. If choose paper I(MEDICINAL BOTANY AND PHYTOPHARMACOGNOSY) A. Herbal Drug Authentication and Analysis Duration 3 hours Marks:100 i) Referring to National/Regional Floras Describe the given medicinal plants with floras and identify their genus and species 10 Marks. 20 Minutes Character description 5 Marks Identification of Genus 2 Marks Identification of species 3 Marks. ii) Description Describe the Morphological and Organoleptic characters of given Herbal raw drugs 10 Marks. 20 Minutes Description of Morphological character 5 Marks Description of Organoleptic character 5 Marks iii) Grading Analyse various grades and demonstrate the characters of different herbal drugs 10 Marks. 20 Minutes Grades and their names 4 Marks Quality of grades and character explanation 6 marks iv) Anatomy Perform micro-sectioning of the given herbal drug and make a permanent slide 30	100

Marks. 1 Hour.

Sectioning 5 Marks. 10 minutes

Processing 20 Marks. 40 minutes

Mounting 5 Marks. 10 Minutes

v. Foreign organic matter

Detect the foreign matter present in the major herbal drugs. 10 Marks. 10 Minutes

Detection 5 Marks. 5 minutes

Quantification 5 Marks. 5 minutes

vi. Histochemical Analysis.

Perform qualitative histochemical analysis of the given plant drugs. 10 Marks. 20 Minutes

Sectioning 3 Marks

reaction with suitable Reagent 3 Marks

identification of the compound 4 Marks

vii. Powder Microscopy

Observe the anatomical key distinguishing characters of the given herbal drugs. 10 Marks. 20 Minutes.

Preparation of the drug for analysis 3 marks.

Observation and documentation 4 marks.

Drug identification 3 Marks.

viii. Comparison of adulterants

Distinguish the adulterants from the genuine source drugs through morphological and microscopical characters. 10 Marks. 10 Minutes.

Characters and qualities of Source drug 5 Marks

Characters and qualities of Adulterant drug 5 Marks.

Or

If Choose Paper II(GUNAPADAM MOOLIGAI INCLUDING PHYTOPHARMACOLOGY)

(Any two from the following practicals will be paired and given) 2 X 50 marks = 100 marks

Duration : 3 Hours - 1 ½ hour for each)

1.Purification of Herbal raw drugs

(i) Thevaiyana sarakukal and Thevaiyana karuvigal (Required materials) - 5 Marks

(ii) Identification of Raw drugs, Morphological and Organoleptic characters - 5 Marks

(iii) Suththi Murai (Purification Method) - 5 marks

(iv) Seimurai (Standard operating procedure) - 20 Marks

(v) Seyalmuarai vilakkam (Demonstration of Procedure) - 5 Marks

(vi) Maruthuva payankal (Therapeutic uses) and Labelling - 5 Marks

(vii) Interpretation based on Suvai(Taste), Seikai(Action), Chemical constituents and

names of medicine pertaining to the raw drug - 5 Marks

Or

2. Phytochemical and Inorganic compounds analysis of Herbal raw drug before and after purification Duration 45 minutes for each one(50 Marks)

(a) Qualitative Phytochemical and Inorganic compounds analysis of Herbal raw drug before purification

(i) Aim and Objective - 2 Marks (2 Minutes)

(ii) Required equipments and reagents - 3 Marks (3 Minutes)

(iii) Preparation of extract - 5 Marks (15 Minutes)

(iv) Standard operating procedure - 10 Marks (20 Minutes)

(v) Inference and results - 5 Marks (5 Minutes)

(b) Qualitative Phytochemical and Inorganic compounds analysis of Herbal raw drug after purification

- (i) Preparation of extract - 5 Marks (15 Minutes)
- (ii) Standard operating procedure - 10 Marks (20 Minutes)
- (iii) Inference and results - 5 Marks (5 Minutes)
- (iv) Interpretation of Two results - 5 Marks (5 Minutes)

Or

3. (b) Molecular docking for given compound

- (i) Aim and Objectives - 5 marks
- (ii) Standard Operating procedure -5 marks
- Step 1 : Install auto dock tools - 5 marks
- Step 2 : Prepare the plant protein (receptor) – 10 marks
- Step 3 : Prepare the ligand – 5 marks
- Step 4 : Grid Generation – 5 marks
- Step 5: Docking simulation – 5 marks
- Step 6: Analyze the results – 5 marks
- Step 7: Validation and further optimization – 5 marks

Or

4.Preparation of mooligai uppu/Saththu

- (i) Thevaiyana sarakukal and Thevaiyana karuvigal (Required materials) - 5 Marks
- (ii) Identification of Raw drugs, Morphological and Organoleptic characters - 5 Marks
- (iii) Seimurai (Standard operating procedure) - 10

Marks

(v) Seyalmuarai vilakkam (Demonstration of Procedure) - 15 Marks

(vi) Maruthuva payankal (Therapeutic uses) and Labelling - 5 Marks

(vii) Interpretation based on Suvai(Taste), Seikai(Action), Chemical constituents - 10 Marks

Or

5. Calorific value of the given sample

Aim and Objective – 5 marks

Required materials – 5 marks

Sample preparation – 5 marks

Working principle of the instrument used – 5 marks

Experimental procedure – 15 marks

Calculation and Interpretation – 10 marks

Result – 5 marks

Or

6. Novel food preparation for NCD.

Select one NCD – 2 marks

Importance of the particular food for the disease – 8 marks

No. of items for a complete meal plater – 10 marks

Ingredients – 5 marks

Equipment required – 5 marks

Method of preparation – 10 marks

Nutritional aspect and interpretation – 10 marks

Or

7. Millet based food preparation/sweets.

Select one or two millets/ traditional rice– 5 marks

Importance of the particular millets/ traditional rice for a particular disease – 10 marks

No. of items for a complete meal plater – 5 marks

Ingredients – 5 marks

Equipment required – 5 marks

Method of preparation – 10 marks

Nutritional aspect and interpretation – 10 marks

Or

8. Preparation of Higher order medicine using single herbal juice.

(i) Thevaiyana sarakukal and Thevaiyana karuvigal (Required materials) - 5 Marks

(ii) Identification of Raw drugs, Morphological and Organoleptic characters - 5 Marks

(iii) Seimurai

(Standard operating procedure) - 10 Marks

(v) Seyalmuarai vilakkam (Demonstration of Procedure) -15 Marks

(vi) Maruthuva payankal (Therapeutic uses) and Labelling - 5 Marks

(vii) Interpretation based on Suvai(Taste), Seikai(Action), Chemical constituents - 10 Marks

OR

If choose Paper III(GUNAPADAM THATHU & JEEVAM- MATERIA MEDICA OF METALS MINERLS &ANIMAL ORGIN

1.Purification of raw drugs in metals, minerals origin Two questions each 50 marks
2X 50 marks = 100 Mark Duration : 3 Hours - 1 ½ hour for each)

Any two Various purification methods should be used for one raw drug(Ulogangal, Panchasootham ,and Paadanangal)

or

Any two Various purification methods should be used for Two raw drug(Karasaram, Uparasam)

Ulogangal , Panchasootham: Ayam, Sembu, Nagam, Velli, Velvangam, Karuvangam, Kaantham, Rasam, Pooram, Veeram, Lingam, Mirutharsingi

Paadanankal -Gandhagam, Anjanakal, Gowri paadanam Vellai padanam, kuthiraipal paadanam, Manosilai

Karasaram-Seenakaram, Navatcharam, , Indhuppu , Pooneru , Vediuppu ,Venkaram

Uparasam- Abragam, Annabethi ,Karpoorasilasathu , Koomoothira silasathu, Kalnar, Kavikkal ,Thurusu ,Nandukkal,Palthutham, Karudakal ,of the following headings

Murai(Methods) -5 marks

Thevayana sarakukal (Required Raw drugs in metals/minerals) -5 Marks

Thevayana karuvigal (Required materials) - 5 Marks

Seimurai(Standard operating procedure) - 10 Marks

Seyalmuarai vilakkam(Demonstration) -15 Marks

Payan(Therapeutic uses) – 5 Marks

Adayalaa cheettu(Labelling) - 5 markS

OR

If choose Paper IV(ESSENTIALS OF PHARMACOLOGY)

I. Analyze the given dataset for Pharmacokinetic parameters, suitable statistical test and critically analyze the published research article and write a structured abstract.

1.1. Calculating pharmacokinetic parameters in a given data using software- 10 Marks

Define the key pharmacokinetic parameters like C_{max} (maximum concentration), T_{max} (time to reach C_{max}), Half-life (t_{1/2}), AUC (Area Under the Curve), Clearance (Cl), and Volume of Distribution (V_d)- 2 Marks

Software Usage- 3 marks

Calculation of Key Parameters: C_{max} and T_{max}, Half-life (t_{1/2}) and AUC- 4 marks

Interpretation of Results- 1 mark

1.2 Perform Statistical analysis of given data using software- 30 Marks

Data description and data cleaning- 3 Marks

Choice of Statistical test- 5 Marks

Performing the suitable statistical test-20 Marks

Results and interpretation-2 marks

1.3 Critical appraisal of a published paper- 50 Marks

Introduction- 5 Marks

Study design and Methodology-15 Marks

Results- 10 Marks

Discussion and interpretation- 10 Marks

Ethical consideration- 5 Marks

Quality and reliability of the paper- 5 Marks

1.4 ?Abstract writing of a published paper- 10 Marks

Describe the research question or the objective of the study- 2 Marks

Overview of the study design and methods used- 2 Marks

Highlighting the most important findings- 3 Marks

Conclusions drawn from the study- 2 Marks

Clarity and Conciseness- 1 Mark

(or)

2. How would you design a protocol for a preclinical trial, including the preparation of Form B, and assess the generated preclinical toxicity data for regulatory compliance?

2.1. Protocol designing for preclinical trials and Form B preparation- 75 marks

Study rationale- 5 Marks

Study design- 5 Marks

Animal model selection- 10 Marks

Dose selection and route of administration- 5 Marks

Endpoints and outcome measures- 10 Marks

Data collection and analysis- 5 Marks

Ethical consideration- 5 Marks

Study timeline and milestone-5 Marks

Form B preparation-25 Marks

2.2. Assessment of preclinical toxicity data- 25 Marks

Overview of the importance of preclinical toxicity testing in drug development- 3 Marks

Clinical signs of Toxicity findings- 5 Marks

Organ specific toxicity-5 Marks

Dose response relationship- 5 Marks

Evaluation of safety margin/Toxicity classification as per guidelines- 2 Marks

Toxicity mechanism and biochemical markers- 5 Markers

2	MINOR PRACTICALS : Total Duration(2 Hours 50 Marks) - Each one question from Four papers (Paper1, Paper 2 paper 3 Paper 4) Paper I - 20 Minutes(10 Marks) Paper II- 40 Minutes(15 Marks) Paper III - 40 Minutes(15 Marks) Paper IV - 20 Minutes(10 Marks) Paper I - MEDICINAL BOTANY AND PHYTOPHARMACOGNOSY Duration -20 minutes Mark-10 Marks Prepare a herbal facial cream (Any one test) Prepare a herbal hair lotion Key Methodology 3 Marks. 5 Minutes Demonstration 4 Marks. 15 Minutes Perfection 3 Marks. Or Perform quadrat Analysis of the earmarked area, document the occurrence and diversity of medicinal plants. Key Standard operating procedure. 3 Marks. 5 Minutes. Area marking and documentation. 4 Marks. 10 minutes Result and discussion. 3 Marks. 5 Minutes Paper II(GUNAPADAM MOOLIGAI INCLUDING	50
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PHYTOPHARMACOLOGY)

Students should choose their Minor Practical For any one of following test

Solubility of substance in different solvents

Aim – 1 mark

Materials required – 2 marks

Chemicals/substances used – 2 marks

Procedure – 5 marks

Observation – 1 mark

Result – 2 marks

Conclusion – 2 marks

Or

Determination of pH in given sample

Sample preparation – 5 marks

Procedure – 5 marks

pH reading – 2 marks

Result & Discussion – 3 marks

Or

Determination of Refractive index in given oil

Working principle of Refractometer – 5 marks

Procedure – 5 marks

Comparison of pure and adulterant – 2 marks

Interpretation & Result – 3 marks

Or

Determination of foreign matter

Aim – 1 mark

Materials required – 2 marks

Procedure – 5 marks

Observation – 2 marks

Result – 3 marks

Interpretation – 2 marks

Or

UV Absorbance of extract

Aim – 1 mark

Materials required- 2 marks

Sample preparation – 3 marks

Procedure – 5 marks

Observation – 2 marks

Result – 2 marks

Or

Biochemical analysis

Aim – 1 mark

Materials required – 2 marks

Procedure – 6 marks

Observation – 3 marks

Result – 3 marks

Or

Particle size analysis using sieves

Aim – 1 mark

Apparatus required- 2 marks

Mesh – 1 mark

Procedure – 5 marks

Result – 3 marks

Conclusion – 3 marks

Or

Rancidity analysis

Aim – 1 mark

Materials required – 3 marks

Procedure – 5 marks

Observation – 3 marks

Result/Interpretations – 3 marks

Or

Physical separation of heterogeneous mixture

Aim – 1 mark

Materials required – 3 marks

Procedure – 6 marks

Observation – 2 marks

Result/Interpretations – 3 marks

Or

Kayakarpam preparation

Description – 1 mark

Raw drug/ medicinal plant required – 2 marks

Instruments required – 2 marks

Standard operating procedure – 5 marks

Uses – 2 marks

Shelf life – 1 mark

Diet regimen – 2 marks

Or

Simple purification methods

Materials required – 3 marks

Instruments required – 3 marks

Procedure – 5 marks

Observation – 2 marks

Uses – 2 marks

Or

Preparation of dyes from medicinal plants

Materials required – 3 marks

Instruments required – 3 marks

Procedure – 5 marks

Observation – 2 marks

Uses – 2 marks

**Paper - III(GUNAPADAM THATHU & JEEVAM- MATERIA MEDICA
OF METALS MINERLS &ANIMAL ORGIN DRUGS)**

Duration- 40 Minutes
Marks

1 ×15 Marks = 15

Students should choose their Minor Practical For any one of following test of milk and milk products/ Honey / Bee Wax

Analytical method for Milk and milk products

I. Milk

1. Detection of adulteration in milk

a. Starch in milk

b. Water in Milk

C. Detergent in Milk

2. Detection of foreign fat in milk

3. Detection of formalin in milk

II. Curd

4. Test for presence of starch in curd

III. Ghee

5. Test for vanaspathi in ghee

6. Test for mineral oil in ghee

II. Honey

7. Determination of reducing sugar, sucrose, Fructose – Glucose ratio.

8. Test for pollens and foreign matters

III. Bees wax

Determination of Melting point of

i. Bee wax

ii. Carnauba wax

iii. Paraffin and other wax of the following headings

- a. Sample preparation - 2 Marks(10 mins)
- b. Aim & objectives - 2 Marks(5 mins)
- c. Required reagents & materials - 2 Marks(10 mins)
- d. Standard operation procedure & demonstration - 7 Marks(10 Minutes)
- e. Inference & Report preparation - 2 Marks(5 minutes)

Or

1. Analysis of pH determination in the given sample

Duration : 40 minutes 1 × 15 =Mark -15 marks

For the following headings

- a. Standard operation procedure - 5 Marks(10 Mins)
- b. Demonstration - 4 Marks(15 Mins)
- c. Inference - 3 Marks(5 Mins)

	d. Report preparation - 3 Marks(10 Mins) Paper -IV (ESSENTIALS OF PHARMACOLOGY) Duration- 20 Minutes 1 ×10 Marks = 10 Marks Screening of analgesics using animals/simulation or Screening of anti-inflammatory drugs using animals/simulation or Screening of anti-epileptics using animals/simulation or Screening of anxiolytics using animals/simulation or Screening of anti-depressants using animals/simulation or Screening of general anaesthetics or Demonstration of Handling, sexing and various routes of drug administration in experimental animal	
3	SPOTTERS Total duration 1 Hour 50 Marks Paper I - 15 Minutes(15 Marks) - 3 spotters	50

Paper II- 10 Minutes(10 Marks)

Paper III - 10 Minutes(10Marks) - 2 spotters

Paper IV - 15 Minutes(15 Marks) - 10 spotters

PAPER I((MEDICINAL BOTANY AND PHYTOPHARMACOGNOSY)

Duration – 15 minutes 15 Marks (5× 3=15)

Total no of spotters - Three spotters

(Each spotters will be allocated with 5 marks in following heads.

1. Any one of the propagation method.

Explain the method of propagation 2 Marks

Significance of the method 1 Mark.

Method suitable for which medicinal plants. Justify. 2 Marks

2. A microscopical permanent slide of a drug.

3. A raw drug or a fresh plant specimen

Identification -2 Marks (1 Min)(Botanical name/chemical name)

Organoleptic/Anatomical characters -1 Marks (1 Mins)

Medicinal uses - 1 Marks (2 Mins)

Name of the formulation pertaining to the drug -1 Mark (1 Min)

Emphasis on practical application in Siddha practice

**Paper - II(GUNAPADAM MOOLIGAI INCLUDING
PHYTOPHARMACOLOGY)**

Total no of spotters - 2 Nos - Each spotters will be allocated with 5 marks

Duration:10 minutes 2×5 Marks =10 Marks

1. Herbal Raw drug/Medicinal plants – Spotter

Identification (Botanical name, Family) -2 Marks(1 Min)

Suvai, Seigai, Pirivu -1 Mark(1 Mins)

General properties (Podhu Gunam) -1 Mark (2 Mins)

Name of the formulation pertaining to the drug -1 Mark (1 Min)

Or

2. Instruments – Spotter

Identification - 2 marks (1 min)

Working principle - 1 mark (1 min)

Instrumentation/components - 1 mark (I min)

Application - 1 mark (I min)

PAPER -III(GUNAPADAM THATHU & JEEVAM- MATERIA MEDICA OF METALS MINERLS &ANIMAL ORGIN DRUGS)

Total no of spotters - 2 Nos - Each spotters will be allocated with 5 marks

2×5 Marks =10 Marks

Duration:10 minutes

1. Write about the Physical properties of drugs - Metals/Minerals/Animal kingdom of the following heads

	Identification - 2 Marks(1 Min) (Botanical name/chemical name/ zoological name) Organoleptic character - 1 Marks(1 Mins) Usage - 1 Marks (2 Mins) Name of the formulation pertaining to the drug - 1 Mark (1 Min) PAPER IV - ESSENTIALS OF PHARMACOLOGY Total no of spotters–10 Total Marks: 15 marks Duration:10 minutes (Spotters will be assigned from the following heads) a. Commonly used drugs - 1 Mark b. Various dosage forms - 1 Mark c. Drug mechanism charts - 2 Marks d. Charts for combined effects of drugs- 2 Marks e. Personal Protective equipments (PPEs)- 1 Mark f. Instruments used in experimental pharmacology- 1 Mark g. Clinical signs of toxicity in experimental animals display- 2 Marks h. Instruments used for drug administration- 1 Mark i. Instruments used for minor surgical procedures in small animals- 2 Marks j. Identify the poisoning and provide Antidote for poisoning- 2 Marks	
4	Assessing Teaching ability Duration:1 hour 30 minutes Total Marks: 25	25

	Content Delivery & Subject Knowledge (10 Marks) – 30 minutes Teaching Methodology & Student Engagement (10 Marks) – 30 minutes Time Management & Concluding Summary (5 Marks) – 30 minutes	
5	Assessing Presentation Skills Students will be presented their research work, such as chemical analysis, Clinical research, preclinical research, field work, review of literature, and meta-analysis Duration: 1 hour 30 minutes Total Marks: 25 1. Content & Subject Knowledge (10 Marks) – 30 minutes 2. Presentation Style & Delivery (10 Marks) – 30 minutes 3. Engagement & Time Management (5 Marks) – 30 minutes	25
6	Viva(4 Examiners : 25 Marks/Each examiner)#	100
7	Log Book(Activity Record)	25
8	Practical Record by Practicals Paper I - 5 Numbers Paper II- 10 Numbers Paper III - 10 Numbers Paper IV - 5 Numbers	25
Total Marks		400

#No separate marks for dissertation viva.

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Abbreviations

Domain		T L Method		Level	
CK	Cognitive/Knowledge	L	Lecture	K	Know
CC	Cognitive/Comprehension	L&PPT	Lecture with PowerPoint presentation	KH	Knows how
CAP	Cognitive/Application	L&GD	Lecture & Group Discussion	SH	Shows how
CAN	Cognitive/Analysis	L_VC	Lecture with Video clips	D	Does
CS	Cognitive/Synthesis	REC	Recitation		
CE	Cognitive/Evaluation	SY	Symposium		
PSY-SET	Psychomotor/Set	TUT	Tutorial		
PSY-GUD	Psychomotor/Guided response	DIS	Discussions		
PSY-MEC	Psychomotor/Mechanism	BS	Brainstorming		
PSY-ADT	Psychomotor Adaptation	IBL	Inquiry-Based Learning		
PSY-ORG	Psychomotor/Origination	PBL	Problem-Based Learning		
AFT-REC	Affective/ Receiving	CBL	Case-Based Learning		
AFT-RES	Affective/Responding	PrBL	Project-Based Learning		
AFT-VAL	Affective/Valuing	TBL	Team-Based Learning		
AFT-SET	Affective/Organization	TPW	Team Project Work		
AFT-CHR	Affective/ characterization	FC	Flipped Classroom		
		BL	Blended Learning		
		EDU	Edutainment		
		ML	Mobile Learning		
		ECE	Early Clinical Exposure		
		SIM	Simulation		
		RP	Role Plays		
		SDL	Self-directed learning		
		PSM	Problem-Solving Method		
		KL	Kinaesthetic Learning		
		W	Workshops		
		GBL	Game-Based Learning		
		LS	Library Session		
		PL	Peer Learning		
		RLE	Real-Life Experience		
		PER	Presentations		
		D-M	Demonstration on Model		
		PT	Practical		
		X-Ray	X-ray Identification		
		CD	Case Diagnosis		

		LRI	Lab Report Interpretation		
		DA	Drug Analysis		
		D	Demonstration		
		D-BED	Demonstration Bedside		
		DL	Demonstration Lab		
		DG	Demonstration Garden		
		FV	Field Visit		
		JC	Journal Club		
		Mnt	Mentoring		
		PAL	Peer Assisted Learning		
		C_L	Co Learning		
		DSN	Dissection		
		PSN	Prosection		