

**Curriculum for MD/MS Ayurveda
(PRESCRIBED BY NCISM)**

अभ्यासात्प्राप्यते दृष्टिः कर्मसिद्धिप्रकाशिनी ।

**Semester III-VI
Rasashastra and Bhaishajya Kalpana
(Pharmaceutics and Clinical Pharmacy)
(SUBJECT CODE : AYPG-RB)**

(Applicable from 2024-25 batch, from the academic year 2025-26 onwards until further notification by NCISM)



आयुषे सर्वलोकानाम्



**BOARD OF AYURVEDA
NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE
NEW DELHI-110026**

PREFACE

Treatment success greatly depends on the quality of medicines and their judicial application. Rasashastra and Bhaishajya Kalpana deal not only with assuring quality during manufacturing but also in advising the rational application of herbal and herbomineral products.

Yoga Vijnana and Prayoga Vijnana which are comparable with pharmaceutics and pharmaceuticals form the base of study here. After successful completion of the course a postgraduate in Rasashastra and Bhaishajya Kalpana shall be the specialist in 'Ayurvedic Pharmaceutics and Pharmaceuticals, He is expected to have fundamental and applied knowledge in Rasashastra and Bhaishajya Kalpana in detail and also ability to understand the processes described in Rasashastra in the light of chemistry and chemical technology, He should have classical and contemporary knowledge on drug manufacturing including newer dosage forms and drug development and the ability to identify the need and areas of research in Rasashastra and Bhaishajyakalpana, He must be familiar with the drug standardization and quality control as well as quality assurance methods and related equipment with adequate knowledge of standard databases about drug and ability for preparation of drug dossier; He needs to be familiar with drugs & cosmetic and other relevant acts with the knowledge of pharmacovigilance. He is expected to have the ability to authenticate raw materials of Rasashastra along with understanding and application of material and operational management, clinical pharmacy, and pharmacy practice.

Competence is the ability to perform a role or task effectively by integrating knowledge, skills, personal attitudes, and values. It also involves applying knowledge and skills gained through experience and learning.

After successfully implementing competency-based learning in undergraduate studies, it is now essential to revise and update the postgraduate syllabus for *Rasashastra* and *Bhaishajya Kalpana* to align with a Competency-Based Dynamic Curriculum. This updated syllabus is designed to equip postgraduates with the core competencies expected in these fields. Along with cognitive and psychomotor skills, greater emphasis is placed on experiential learning to enhance practical expertise.

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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)

Curriculum MD/ MS Ayurveda

Rasashastra and Bhaishajya Kalpana (AYPG-RB)

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 (Rasashastra(Iatrochemistry) – Principles and Practices)			
M1 Chronological Development and Taxonomy of Rasa Dravyas	2	60	50
M2 Puta and Samskara (Transformative processes of drug manufacturing)	2	60	50
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)			
M9 Scientific fundamentals of Ayurvedic Pharmaceutical preparations	2	60	50
M10 Principles of pharmaceutical formulation	2	60	50
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)			
M17 Guidelines for administration of Rasoushadhi in clinical Practice	2	60	50
M18 Prayogika Bhaishajya Kalpana(Clinical application of Pharmaceutical products)	2	60	50
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)			
M25 Artificial intelligence in drug development and Pharmacogenetics; Pharmacogenomics	2	60	50
M26 Pharmacology	2	60	50
Total	16	480	400
Semester No : 4			

Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)			
M3 Parada (Mercury) and Its Processing: Ancient wisdom and Scientific advances	2	60	50
M4 Maharasa Dravya, its processing and utility	2	60	50
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)			
M11 Mana Paribhasha (Metrology in Ayurvedic Pharmaceutical preparation)	2	60	50
M12 Process validation Protocol	2	60	50
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)			
M19 SOP and clinical application of Chaturvidha Rasayana	3	90	75
M20 SOP and Clinical application of Ayaskriti, Louha, and Mandura Kalpa	1	30	25
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)			
M27 Network pharmacology & Reverse Pharmacology	2	60	50
M28 Pharmaceutical Quality Assurance	2	60	50
Total	16	480	400
Semester No : 5			
Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)			
M5 Critical appraisal of Uparasa Dravya and Sadharana Rasa Dravya	2	60	50
M6 Critical appraisal of Dhatu and Updhatu	2	60	50
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)			
M13 Krutanna (Ayurvedic Food Preparations)	2	60	50
M14 Ayurvedic Formulations for Holistic Wellbeing, Vitality and Body Care	2	60	50
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)			
M21 Clinical application of Rasoushadhi according to Srotas and in selected challenging clinical conditions	1	30	25
M22 Yogas from different Kalpanas	3	90	75
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)			
M29 Pharmacy Practice	2	60	50
M30 Pharmaceutical Microbiology	2	60	50
Total	16	480	400
Semester No : 6			

Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)			
M7 Sudha Varga, Sikata Varga, Visha Varga Dravyas	3	90	75
M8 Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana	1	30	25
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)			
M15 Disease condition specific selection of formulation	2	60	50
M16 Current trends in Ayurvedic Pharmaceutical Industry.	2	60	50
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)			
M23 SOP and clinical applications of Churna Kalpana(Powder dosage forms)	3	90	75
M24 Therapeutic significance of Topical dosage forms	1	30	25
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)			
M31 Regulatory Acts and Rules applicable to Ayurvedic Drugs	3	90	75
M32 Entrepreneurship and Start-Ups	1	30	25
Total	16	480	400
Grand Total	64	1920	1600

Credit frame work

AYPG-RB 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 Ayurveda 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 syllabus24ayu@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 3 Crs M-20 1 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 1 Crs M-22 3 Crs	M-29 2 Crs M-30 2 Crs	16

Semester 6	M-7 3 Crs M-8 1 Crs	M-15 2 Crs M-16 2 Crs	M-23 3 Crs M-24 1 Crs	M-31 3 Crs M-32 1 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	20	
Paper -3	100		Assessing presentation skills	20	
			Viva (4 examiners: 20 marks/each examiner)	80	
Paper -4	100		Dissertation Viva	40	
			Logbook (Activity record)	20	
			Practical/Clinical Record	20	
Semester VI University examination – 800 Marks					

* Details in 6H table

Course Code and Name of Course

Course code	Name of Course
AYPG-RB	Rasashastra and Bhaishajya Kalpana (Pharmaceutics and Clinical Pharmacy)

Table 1 : Course learning outcomes and mapped Program learning outcomes

CO No	A1 Course learning Outcomes (CO) AYPG-RB At the end of the course AYPG-RB, the students should be able to-	B1 Course learning Outcomes mapped with program learning outcomes.
CO 1	Elucidate classical Ayurvedic knowledge in alignment with multidisciplinary principles applied to Ayurveda pharmaceuticals.	PO1,PO3,PO7
CO 2	Evaluate the use of classical texts of Rasashastra and Bhaishajya Kalpana in research and drug development.	PO1,PO5,PO7
CO 3	Classify, identify, and authenticate raw drugs using both ancient Ayurvedic and contemporary methods.	PO1,PO2,PO3,PO7
CO 4	Apply quality control (QC) and quality assurance (QA) processes for in-process control and finished products, integrating classical methods with modern technical advancements.	PO2,PO3,PO5,PO7
CO 5	Identify global healthcare needs and research areas, and design, develop, and manufacture innovative dosage forms in compliance with regulatory standards.	PO1,PO2,PO3,PO7,P O8
CO 6	Justify the clinical administration of Ayurvedic formulations and adapt them for emerging health conditions.	PO4,PO6,PO7,PO8
CO 7	Analyze the application of material and operational management, pharmacy practice, and pharmacology in Ayurvedic pharmaceuticals.	PO1,PO5,PO6
CO 8	Evaluate current and emerging trends in Ayurvedic pharmaceuticals with a focus on interdisciplinary scientific advancements.	PO5,PO7,PO8

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

Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)						
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 Chronological Development and Taxonomy of Rasa Dravyas This module will cover the philosophical relevance and ancient background of Rasashastra, including the classification of Rasa Dravyas. It provides a comprehensive understanding of Rasashastra, spanning from the ancient Vedic era to the present day, covering the chronological development of Rasashastra and Rasaushadhis. Additionally, the module explores various classifications related to Rasa Dravyas with their principles/logics, along with the availability of original / identified Rasa Dravya, as well as Sandigdha (Controversial), Anupalabdha (Not Available), Krutrima (Artificial), and Pratinidhi (Substitute) Dravya concerning Rasa Dravya • M1U1 Chronological Development and Overview of Rasashastra 1.1.Philosophical Relevance of Rasashastra 1.2.Chronological Development of Rasashastra 1.3.Integration of the development of Iatrochemistry with modern chemistry • M1U2 Taxonomy of Rasadravyas	2	10	20	30	60

	2.1 Taxonomy of Rasadravyas 2.2 Concepts and justification about division of Rasadravyas 2.3 Mendeleev periodic table • M1U3 Geological/mineralogical identification of Rasadravyas 3.1 Grahya-Agrahyata of Rasadravyas 3.2 Geological/Mineralogical identification of Rasadravyas • M1U4 Overview of Sandigdha, Anupalabdha, Krutrima, and Pratinidhi Dravyas in the Context of Rasa Dravya 4.1 Sandigdha (Controversial) Rasadravya 4.2 Anupalabdha (Not Available) and Krutrima (Artificial) Rasadravya 4.3 Pratinidhi (Substitute) Rasadravya					
2	M-2 Puta and Samskara (Transformative processes of drug manufacturing) This module, Puta and Samskara (Principles of Drug Manufacturing), integrates Puta with thermochemistry and different laws regarding heating. Additionally, elaborate about the role and Significance of Samskara (Principles of Drug manufacturing) • M2U1 Puta and Law of thermodynamics 1.1 Definition, Significance and Classification of Puta 1.2 Laws of thermodynamics, Thermochemistry, Griffith theory, Collision theory, etc. 1.3 Heating devices and fuels, with detailed knowledge about temperature, duration, designing and construction of different Puta • M2U2 Concept, understanding, application, SOPs and chemical changes of	2	10	20	30	60

Jarana, Amritikarana and Lohitikarana

2.1 Principle and Significance of Jarana Procedures

2.2 Application of Amritikarana and Lohitikarana procedures in bhasma preparation

2.3. Standard Operating Procedures (SOP) and Chemical Changes of Jarana, Amritikarana, and Lohitikarana

• **M2U3 Concept, understanding, application, SOPs (Standard Operating Procedures) and chemical changes of Satva and Druti procedures**

3.1 Principle and Significance of Satva and Druti Procedures

3.2 Application and analysis of Satva and Druti procedures

3.3.SOP and chemical changes of Satva and Druti

• **M2U4 Samskara (Principles of Transformative processes of drug manufacturing)**

4.1 Application of Toya Sannikarsha (Processing with water) and Agni Sannikarsha (Processing with Heat), Toyagni Sannikarsha (Processing with water and Heat) in drug manufacturing

4.2 Shaucha and Manthana (churning)

4.3 Vasana (process of infusing aroma), and Bhavana (Effect of Levigation / Trituration)

• **M2U5 Influence of Desha (place) and Kala(time and seasonal factors) of drug qualities**

5.1. Influence of Desha (geographical area and place of manufacturing) on drug quality

5.2. Influence of Kala (processing time, season, and maturity of herbs) on drug quality

• **M2U6 Kalaprakarsha- Processing with/Effect of specific time exposure and Bhajana (processing vessel)**

5.1 Knowledge of Kalaprakarsha (Time taken for drug processing)

	5.2 Knowledge of Bhajana (vessels used for manufacturing) 5.3.Environmental and Temporal Influences on Drug Quality and Processing					
		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 Parada (Mercury) and Its Processing: Ancient wisdom and Scientific advances This module, Parada (Mercury) and Its Processing, provides a comprehensive understanding of Parada, its Dosha, Shodhana-Marana techniques, Parada Gati, Samskara, therapeutic utility with ancient and contemporary science, along with Mercury Poisoning and Antidotes. • M3U1 Parada: Ancient and Contemporary Perspectives on Its Shodhana and Underlying Principles 1.1 Ancient & Contemporary knowledge of Parada/ Mercury 1.2 Parada Dosha, Shodhana(Purification) of Parada and its significance 1.3 Principles of Parada Jarana and Parada Murcchana 1.4 Utility of Parada Bandha	2	10	20	30	60

	• M3U2 Parada Ashta Samskara and Ashtadasha Samskara 2.1 Parada Samskara with research updates 2.2 Pharmaceutical equipment design for Parada Ashta Samskara 2.3 Hands-on experience of Parada Ashta Samskara • M3U3 Physico-chemical properties and pharmacology of mercury and mercurial compounds 3.1. Mercury metallurgy 3.2. Stoichiometry of mercury 3.3. Pharmacodynamics and pharmacokinetics of mercury and mercurial products • M3U4 Mercury toxicity, ADR and its management 4.1 Mercury poisoning and its types 4.2 Ancient and Contemporary knowledge about the Treatment of Mercury poisoning					
4	M-4 Maharasa Dravya, its processing and utility This module, Maharasa Dravya, its processing and utility, provides a comprehensive understanding of Identification, Authentication, Shodhana, Maranadi Vidhi, Bhasmikarana, SOPs, Therapeutics uses, Anupan, Characterization, and Research updates, etc. of Maharasa Dravya • M4U1 Maharasa Dravyas with special reference to Abhraka and Vaikranta 1.1. Comparative analysis of Maharasa Dravyas mentioned in various texts 1.2. Characterization of Maharasa dravyas 1.3. Abhraka	2	10	20	30	60

	1.4. Vaikranta • M4U2 Principles and Processing of Makshika and Vimala 2.1 Critical understanding of Makshika (Copper Pyrite) 2.2 Detailed understanding of Vimala (Iron Pyrite) • M4U3 Principles and Processing of Shilajit and Sasyaka 3.1 Shilajatu (Black Bitumen) 3.2 Sasyaka(Bornite)/Tuttha(Blue Vitriol) • M4U4 Principles and Processing of Chapala and Kharpara, along with physico-chemical analysis, with research updates of all Maharasa Dravyas Bhasma/ Shodhita products 4.1 Chapala 4.2 Kharpara • M4U5 Utility of new metals and minerals 5.1 New metals/ minerals that align with Maharasa Dravyas					
		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

5	M-5 Critical appraisal of Uparasa Dravya and Sadharana Rasa Dravya This module, Processing and utility of Uparasa Dravya and Sadharana Rasa Dravya, its processing and utility, provides a comprehensive understanding about Identification, Authentication, Shodhana, Maranadi Vidhi, Bhasmikanana, SOPs, Therapeutics uses, Anupan, Characterization, and Research updates, etc. of Uparasa Dravya and Sadharana Rasa Dravya • M5U1 Principle and Processing of Uparasa Dravya 1.1 Uparasa Dravyas mentioned in various texts 1.2 Characterization of Uparasa Dravyas 1.3 Pharmaceutical processes of Uparasa Dravya 1.4 Pharmacology and clinical application of Uparasa Dravya • M5U2 Principle and Processing of Sadharana Rasa 2.1 Sadharana rasa Dravyas mentioned in various texts 2.2 Characterization of Sadharana Rasa Dravyas 2.3 Pharmaceutical processes of Sadharana rasa Dravya 2.4 Pharmacology and clinical application of Sadharana rasa Dravya	2	10	20	30	60
6	M-6 Critical appraisal of Dhatu and Updhatu This module, Dhatu / Updhatu, along with Metals, provides a comprehensive understanding of Identification, Authentication, Standard Operating Procedures, Pharmacopoeial Standards, Quality Control, Shelf Life, Contemporary knowledge, instrumental characterization, analytical specifications, and Research Updates of Dhatu / Lauha, along with Metals • M6U1 Principle and Processing of Dhatu / Metals	2	10	20	30	60

	1.1 Dhatus mentioned in Rasa classics 1.2 Classification and characterization of metals 1.3 Pharmaceutical processing (Shodhana, Marana, etc.) 1.4 Therapeutic uses, toxicity, and safety of metallic preparations • M6U2 Principle and Processing of Upadhatu 2.1 Classical analysis of Upadhatu 2.2 Classification, sources, and characteristics of Upadhatu 2.3 Pharmaceutical processing (Shodhana, Marana, etc.)of Upadhatu 2.4 Pharmacological actions and clinical application of Upadhatu					
		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 Sudha Varga, Sikata Varga, Visha Varga Dravyas This module explores the properties and applications of drugs categorized under Sudha Varga, Sikata Varga, and Visha Varga, as described in various classical texts. It delves into the mineralogical identification and physico-chemical characteristics of these substances, as well as their pharmaceutical processes and pharmacology. Furthermore, the module examines the clinical applications	3	15	30	45	90

of Sudha and Sikata Varga drugs, providing valuable insights into their therapeutic uses. Additionally, it covers the Shodhana (purification) processes, phytochemistry, therapeutic applications, and research updates on Visha Dravya (poisonous substances), highlighting their potential benefits and risks.

• **M7U1 Characterization, Pharmaceutical Processing, and Clinical Applications of Sudha Varga Dravya**

- 1.1 Classification and Identification of Sudha Varga Dravyas
- 1.2 Pharmaceutical Processing of Sudha Varga Dravya
- 1.3 Quality Control Methods for Sudha Varga Dravya
- 1.4 Pharmacology, Therapeutic Applications, and Research Updates on Sudha Varga Dravya

• **M7U2 Characterization, pharmaceutical processing, and clinical applications of Sikata Varga Dravya**

- 2.1 Identification of Sikata Varga dravyas according to various classics, identified based on mineralogical characters
- 2.2 Shodhana, marana, and other pharmaceutical processes of Sikata varga Dravya as per the SOP laid down
- 2.3 Quality control methods for the drugs of Sikata Varga Dravya
- 2.4 Pharmacology, therapeutic application, and research updates on Sikata Varga Dravya)

• **M7U3 Pharmaceutical processing, phytopharmacology and clinical applications of Visha Varga dravya**

- 3.1 Drugs of Visha and Upavisha categories from different classics
- 3.2 Shodhana of Visha-Upavisha Dravya based on different references
- 3.3. Phytochemical changes after the process of Shodhana
- 3.4. Clinical application and therapeutics of Visha Varga

8	M-8 Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana This module, ‘Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana’, explores the concept of Ratna and Uparatna as described in classical Rasashastra texts. It covers the identification of these substances using key mineralogical characteristics and discusses their substitutes. Additionally, the module delves into the crystallography, pharmacology, and therapeutic applications of Ratna and Uparatna. The module also examines the concept, significance, and therapeutic value of Pishti Kalpa, Gandhaka Druti, and Gandhaka Taila, including their pharmaceutical modifications. • M8U1 Mineralogy, Crystal chemistry, and Pharmacotherapeutics of Ratna-Uparatna Varga 1.1 Precious stones. 1.2 Uparatna and semiprecious stones 1.3 Crystal chemistry and mineralogical properties of Ratna-Uparatna 1.4 Pharmacology and therapeutic applications of Ratna and Uparatnas • M8U2 SOP and therapeutic applications of Pishti, Gandhaka Druti and Gandhaka Taila kalpana 2.1 Pishti Kalpana: Concept, SOP, and Therapeutic Applications 2.2. Classical concept of Druti 2.2 Gandhaka Druti and Gandhaka Taila Kalpana: Concept, SOP, and Therapeutic Applications 2.3 Pharmaceutical Modifications of Gandhaka Druti and Gandhaka Taila	1	5	10	15	30
		4	20	40	60	120

		16	80	160	240	480
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)						
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
9	M-9 Scientific fundamentals of Ayurvedic Pharmaceutical preparations This module will provide a foundation for the study of Pharmaceutics in Ayurveda. Classical references provide profound knowledge about processing concepts. This module consists of details about the Raw material identification, Process validation, and Endpoint knowledge, which are important points to be considered in drug preparation. This module is a fundamental introduction to the study of classical Ayurvedic pharmaceutical preparations. • M9U1 Classical Principles of drug processing and scientific basis of Panchavidha Kashaya Kalpana 1.1 Bhaishajya Synonyms and significance of its knowledge 1.2 Classical principles of processing 1.3 Scientific review of Panchavidha Kashaya Kalpana and Upakalpana • M9U2 Identity, Purity and Quality of Raw materials used in Ayurveda	2	10	20	30	60

	Pharmaceutics 2.1 Classical knowledge about Identity, Purity, Quality of Raw material 2.2 Collection of Raw material- GACP, QAQC parameters 2.3 Adulteration and Contamination 2.4 Substitute drugs (Pratinidhi Dravya) • M9U3 Pharmaceutical processing of drugs with its rationality 3.1 Processing of Drugs- Classical methodology 3.2 Simple and unique remedies from classical texts prepared with various processing methods 3.3 Rationality behind the Processing Method of Classical Dosage Forms 3.4 Siddhilakshanani (End-point assessment of pharmaceutical process) and its significance • M9U4 Ayurvedic Classical Dosage Forms and their integration with modern scientific validation 4.1 Classification of the source of raw material and the variety of dosage forms 4.2 Multiple factors responsible for Process optimization 4.3 Key qualities of good pharmaceutical products to ensure safety, efficacy, and authenticity. 4.4 Research updates about the Integration of traditional wisdom with modern scientific validation.					
10	M-10 Principles of pharmaceutical formulation This module includes comprehensive knowledge of applied principles of Samskara performed during the preparation of various formulations to increase their potency.	2	10	20	30	60

• **M10U1 Principles of Samskara (transformative processes of drug manufacturing) in relation to drug development**

- 1.1 Qualities of drugs/Procedures involved in the preparation of dosage forms
- 1.2 Classical concept of Samskara and expected alterations in qualities
- 1.3 Key role of Samskara in pharmacological and therapeutic modification of the drug
- 1.4 Modifications in samskaras in current practices and their consequences

• **M10U2 Rationality behind Composition of Formulations**

- 2.1 Combinations of ingredients (desirable/ inadmissible)
- 2.2 Rational integrity behind the combination of ingredients
- 2.3 Aushadhi Gana (therapeutic groups) or Varga (categories) of medicinal herbs and their role in formulations
- 2.4 Combinations based on predominant pharmacological actions, qualities, or therapeutic usage of the ingredients.

• **M10U3 Principles and designing of various dosage forms**

- 3.1 Principles of dosage form design
- 3.2 Pharmaceutical Considerations
- 3.3 Formulation Considerations
- 3.4 Biopharmaceutical Considerations
- 3.5 Pharmacokinetic Considerations

• **M10U4 Principles of Prakshepa dravyas (Pharmaceutical Additives)**

- 4.1 Prakshepa Dravya- Need, Importance, Proportion (matra)
- 4.2 Pharmaceutical Excipients

• **M10U5 Principles of Potency and Efficacy enhancement**

- 5.1 Classical principles of Potency and efficacy enhancement (Shaktyutkarsha)
- 5.2 Methods of Potency and Efficacy Enhancement in Ayurvedic Classics
- 5.3 Methods of Potency and Efficacy Enhancement in Modern Pharmaceutics

		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
11	M-11 Mana Paribhasha (Metrology in Ayurvedic Pharmaceutical preparation) This module deals with Metrology in the context of Ayurvedic pharmaceutical preparation which primarily refers to the measurement and quantification of substances to ensure reproducibility of standardized drug. • M11U1 Mana Paribhasha (Classical system of measurement) 1.1 Importance of accurate measurements in proportions of ingredients 1.2 Importance of accurate measurements in dosage and administration of drugs 1.3 Types of Mana and details of classical units used for measurement (Weight/ Volume/ Length/ Time) • M11U2 Standard Units of Measurement 2.1 AYUSH Unit Converter 2.2 Utility of converted units in the preparation of Classical formulations	2	10	20	30	60

	• M11U3 Volumetric Vs Gravimetric Methods 3.1 Key differences between Volumetric and gravimetric methods of measurement for a variety of drugs 3.2 Application of volumetric method for preparation of various classical formulations 3.3 Variation in proportion by using both methods and alteration in outcome • M11U4 Rationality of Proportion of Ingredients in Ayurvedic formulations 4.1 Factors accountable for deciding the proportion of ingredients of the formulation 4.2 Profile of Raw Material (Fresh/ dry, Soft/ hard, part used, therapeutic properties, compatibility, etc.) 4.3 Rules for Duplication of ingredients in the same formulation • M11U5 Bulk production of Ayurvedic Formulations 5.1 Modifications expected for bulk production (in Material, Machine, Method, Mechanism) 5.2 Material- Type, proportion, effect of temperature pattern 5.3 Machine used for bulk manufacturing and automated drug manufacturing 5.4 Mechanism of machines used for bulk production and its merits and demerits 5.5 Methods used for bulk production in Ayurvedic Pharmacies and probable alterations in the qualities of the end products.					
12	M-12 Process validation Protocol This Module deals with process validation protocol of Classical as well as advanced and modified dosage forms.	2	10	20	30	60

	• M12U1 Pharmaceutical Preparation process: Classical Dosage forms 1.1 Primary Dosage forms- Panchavidha Kashaya Kalpana and their Upakalpana 1.2 Secondary Dosage Forms- Avaleha Kalpana, Lavana Kalpana, Sneha Kalpana, Gutti-vati-guggulu kalpana, Sandhana Kalpana, Arka-Kalpana, Kshara-kalpana 1.3 Topical Dosage forms- Lepa kalpana, Malahara Kalpana, Upanaha Kalpana • M12U2 Pharmaceutical Preparation process: Recent advances of Dosage forms 2.1 Principles of processes viz. Expression, Extraction, Maceration, Percolation, Infusion, Distillation, Active principle isolation, Particle size reduction, Separation Techniques, Mixing 2.2 Solid Dosage forms- Powders, Pills, Tablets, Capsules, Soft gel capsules, Gummies, Lozenges, Granules. 2.3 Liquid Dosage Forms- Emulsions, Suspensions, Lotions, Liniments, Elixir, Syrup, Nasal Drops, Gargle 2.4 Semi-solid dosage forms- Ointment, Gel, Paste, Cream, Plasters, Suppositories 2.5 Gaseous dosage forms- Aerosols, Nasal Spray, Inhalers • M12U3 Novel Dosage and drug delivery Forms 3.1 Importance and Need of Different Dosage Forms in Drug Delivery Systems and Treatment Modalities. 3.2 Definition, significance, technologies driving Novel dosage forms, applications, and challenges 3.3 Modification of different dosage forms 3.4 Potential areas for future research and development					
		4	20	40	60	120
Semester No : 5						
2A	2B	2C	Notional Learning hours			

Module Number	Modules & units	Number of Credits	2D Lectures	2E Practical Training	2F Experiential Learning including Modular Assessment	2G Total
13	M-13 Krutanna (Ayurvedic Food Preparations) Detailed knowledge and demonstration of classical and modified food preparations, along with regulatory aspects of the food industry, will be discussed in this module. • M13U1 Classification of food substances and Formulations 1.1 Ayurvedic dietary principles and Ahara Dravya Varga (Groups of food substance) 1.2 Aahara -mahabhaishajya: Significance of food substances used as medicine 1.3 Unique classical formulations prepared using Food substances belonging to various groups and their utility in treatment • M13U2 Customized food for treatment 2.1 Disease-specific Ayurvedic Aahara- Therapeutic utility 2.2 Samsarjana krama- Manda, Peya, Vilepi, Yavagu, Yusha, Odana, Krushara, Mansarasa- Process validation Protocol for all formulations 2.3 Personalised prescription of Aushada Siddha Aahara for Shamana and during panchakarma • M13U3 Ayurvedic Food Industry 3.1 Market survey about Ayurvedic food products and research updates 3.2 Global needs and designing of modified food formulations	2	10	20	30	60

	3.3 Semi-processed food/ semi-cooked food, RTC- ready to cook / RTD-Ready to drink Foods and drinks 3.4 Regulation Standards for Ayurvedic Food Preparation (Ayurveda Aahara Regulations- 2021), FSSAI Regulations • M13U4 Food processing technology traditional and modern methods 4.1 Traditional Methods- Steaming, Boiling, Drying, Salting, Smoking, Frying, Marinating, Pickling, Fermentation, 4.2 Modern Methods- Heating, Freeze Drying, Vacuum Drying, Canning, Juicing, Fermentation, Modified atmosphere packaging, Pasteurisation, Smoking, Pulse electric fields technology, Cold plasma treatment, High pressure processing.					
14	M-14 Ayurvedic Formulations for Holistic Wellbeing, Vitality and Body Care This module deals with Rasayana formulations and body care products. Ayurvedic formulations that play a crucial role in promoting holistic well-being and enhancing vitality. are discussed here • M14U1 Rasayana-Personalized Rejuvenation Formulations 1.1 Key aspects of Rasayana Formulations 1.2 General Rasayana and Organ-specific/Target-specific Rasayana- Varnya, Tvachya, Kanthya, Swarya, Keshya, Hrudya, Medhya- Formulations • M14U2 Ayurvedic based cosmetic preparation 2.1 Body/ Hair/ Lip/ Oral/Skin/ Foot care products- Preparation methods and application in Ayurvedic cosmeceuticals 2.2 Preparation process of Lip balm, lipsticks, shampoos, cold cream and vanishing cream, toothpaste, hair dyes, Sunscreen lotion, Face pack, Mask, Toners, herbal soaps, Body wash etc.	2	10	20	30	60

	2.3 Current and Emerging trends – Ayurveda, Ayurvedic footwear, Eye mask					
		4	20	40	60	120
Semester No : 6						
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
15	M-15 Disease condition specific selection of formulation This module deals with the knowledge and critical appraisal of formulations used in various disease conditions and will guide in evaluating the formulation Selection Algorithm. • M15U1 Application of Yukti Pramana in Formulation Selection 1.1 Disease Category and Determination of multiple factors involved in diagnosis and treatment 1.2 Strategic selection of drugs and dosage forms 1.3 Stage-specific selection (Rogavastha and Bhaishajya Kalpana) • M15U2 Selection of formulations for Speciality practice in Ayurveda 2.1 Speciality practice in Ayurveda 2.2 Alignment of formulations with the specialty branch of clinical Practice 2.3 Drugs with ideal guna, virya, vipaka, and of appropriate dosage forms for the	2	10	20	30	60

	patient and pathology 2.4 Evidence-based drugs and dosage form selection for specialty practice. • M15U3 Routes of Drug Administration 3.1 Classical and conventional concepts of Drug Administration. 3.2 Routes of Drug Administration – Need and Relevance 3.3 Factors in the selection of drug and dosage form based on route of administration 3.4 Matching Dosage Forms to Pharmacological Needs by Selected Route 3.5 Properties of formulations and their effect on Pharmacodynamics • M15U4 Designing formulations for Shodhana and Shamana Chikitsa 4.1 Ideal characteristics of drugs as per classics (Matravat Bheshaja lakshanani) 4.2 Principles of Shodhana chikitsa (Purificatory/detoxifying therapy) and actions of formulations used for shodhana - Langhana, Doshanirhana, srotahshodhana 4.3 Principles of Shamana chikitsa (palliative treatment) and actions of formulations used for Shamana- Deepana, Pachana, Stambhana, Rasayana, etc. 4.4 Evidence-based dosage forms and formulations for common diseases • M15U5 Innovation in Ayurvedic Formulations 5.1 Need and current trends in the industry of Ayurvedic Pharmaceutics 5.2 Innovative Formulations-Transdermal patches, Nebulizers, Eye masks, etc. 5.3 Relevance and consequences of innovation done by the R&D department of Ayurvedic Pharmacies 5.4 Knowledge, Attitude, and Practice (KAP) studies on various aspects related to Ayurvedic Formulations available in the market					
16	M-16 Current trends in Ayurvedic Pharmaceutical Industry. This module addresses the key competencies necessary for employment in	2	10	20	30	60

	Pharmacy. It also deals with factory setup, inventory management, QA/QC laboratory setup, and training. This module also discusses career opportunities, market actuals, and competencies needed for various fields of further workplace. • M16U1 Key Competencies Required for Employment in Pharmacy 1.1 Orientation about current trends in the Ayurvedic Pharmaceutical Industry 1.2 Ayurvedic Pharmacy Industry (India & Global Overview): Market size, growth, and key importing countries 1.3 Ayurvedic Products and Market Stakeholders 1.4 Consumer Preferences and Distribution Channels • M16U2 Internship/ Visits to GMP certified Pharmacies 2.1 Factory set up and daily Work flow 2.2 Hygiene checks & Cleaning 2.3 Inventory Management, material management and Production 2.4 Packaging and labelling 2.5 Documentation (batch records) and QC record • M16U3 Quality Assurance and Quality Control (QAQC) Laboratory Training 3.1 Information about Leading Ayurvedic Research Labs in India 3.2 Regulatory & Certification Bodies for QAQC of Ayurvedic Formulations 3.3 Laboratory set up and daily Work flow 3.4 LIMS (Laboratory Information Management System). 3.5 Instrument Calibration, Sample testing and analysis, Record keeping.					
		4	20	40	60	120
		16	80	160	240	480
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)						

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
17	M-17 Guidelines for administration of Rasoushadhi in clinical Practice This module deals with the guidelines for safe and effective clinical application of mercurial, metal, and mineral-based preparations (Rasoushadhi), diet, and regimen to be followed during the administration of Rasoushadhi, adverse effects of improperly processed Rasoushadhi, and the methods to prevent and manage them. • M17U1 Concept of Rasa chikitsa and significance of Rasoushadhi 1.1. Perspectives on the Notion of Rasa 1.2 Significance of Rasa Chikitsa 1.3. Various treatment modalities of Ayurveda	2	10	20	30	60

	• M17U2 Concept of Kshetrikarana and its significance prior to administration of Rasoushadhi 2.1.Etymology and Concept of Kshetrikarana. 2.2. Kshetrikarana for Optimising Medicine Efficacy 2.3.Procedure of Kshetrikarana (Panchakarma & Pancha Shodhana) • M17U3 Pathya -Apathya during Rasayoga Sevana 3.1.Pathya and Apathya Ahara, Vihara, and Manasika Vikara during Rasayoga Sevana 3.2.Importance of Pathya-Apathya during Rasayoga Sevana. • M17U4 Safety and toxicity of Rasoushadhi 4.1.Safety considerations of Rasoushadhi 4.2.Ashuddha and Apakwa Bhasma Sevana Janya Vikara and their management 4.3.Safety and prescription trends of Rasoushadhi • M17U5 Heavy metal toxicity and chelation therapy 5.1.The mechanism of heavy metal toxicity. 5.2.Symptoms of heavy metal toxicity. 5.3.Factors influencing heavy metal toxicity. 5.4.Concept of chelation therapy and risks, and benefits					
18	M-18 Prayogika Bhaishajya Kalpana(Clinical application of Pharmaceutical products) This module deals with the principles essential for effective clinical application of pharmaceutical dosage forms. Emphasis is given to the critical analysis of concepts of Oushadha Sevana Kala(Chronopharmacology and Chronotherapeutics), Anupana (Vehicle), and Matra (Posology)..	2	10	20	30	60

	• M18U1 Aushadha Sevana Kala (Time of administration of drug) 1.1 Classical concept of time of administration 1.2 Biological rhythms and chronobiology 1.3 Chrono-pharmaceutics and chronopharmaceutical drug delivery systems 1.4 Principles of chronopharmacology 1.5 Benefits of chronotherapeutics • M18U2 Concept and scientific basis of Anupana 2.1 Classical concepts of Anupana in Ayurveda 2.2.Role of Anupana in bioavailability 2.3. Anupana for targeted drug delivery and distribution 2.4 Role of Anupana in the mitigation of adverse effects and toxicity 2.5 Anupana for synergistic effect • M18U3 Matra (Posology) 3.1 Definition, importance, and clinical significance 3.2 Factors affecting drug dose 3.3 Posology according to modern pharmacology 3.4 Calculation of paediatric dose • M18U4 Concept of drug repurposing 4.1 Concept of drug repurposing 4.2 Systematic approaches to drug repurposing 4.3 Strategies of drug repurposing 4.4 Methodologies of drug repurposing					
		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
19	M-19 SOP and clinical application of Chaturvidha Rasayana This module covers the Chaturvidha Rasayana Kalpas—Kharaleeya, Parpati, Kupipakwa, and Pottali—highlighting their SOPs, scientific rationale, process validation, and therapeutic applications. It provides insights into their pharmacodynamics, pharmacokinetics, mechanisms of action, and clinical efficacy, while also addressing the repurposing of Rasayogas to meet contemporary clinical needs. • M19U1 Standard Operating Procedure (SOP) and Clinical Application of Khalveeya Rasayana 1.1 Definition and significance of Khalveeya Rasayana 1.2 Standard Operating Procedure for the preparation of Khalveeya Rasayana 1.3 Role of bhavana in potentiating Khalveeya rasayana 1.4 Clinical application of Khalveeya Rasayana with examples • M19U2 SOP and clinical application of Parpati Rasayana 2.1 Definition and significance of Parpati 2.2 Standard Operating Procedure for the preparation of Parpati with process validation	3	15	30	45	90

	2.3 Mechanism of action of Parpati kalpana 2.4 Pathyapathya in Parpati Prayoga and its significance 2.5 Clinical application of Parpati Kalpa with examples • M19U3 SOP and clinical application of Pottali Rasayana 3.1 Definition and significance of Pottali rasayana 3.2 Standard Operating Procedure for the preparation of Pottali Kalpa with process validation 3.3 Role of Gandhaka drava paka in the preparation Pottali rasayana 3.4 Special clinical attributes of Pottali with examples • M19U4 SOP and clinical application of Kupipakwa Rasayana 4.1 Definition and significance of Kupipakwa rasayana 4.2 Standard Operative Procedure for the preparation of Kupipakwa Rasayana with process validation 4.3 Role of Kramagni paka in preparation of Kupipakwa Rasayana 4.4 Chemistry of Kupipakwa rasayana 4.5 Clinical application of Kupipakwa Rasayana Kalpa with examples					
20	M-20 SOP and Clinical application of Ayaskriti, Louha, and Mandura Kalpa This module covers the preparation methods, chemical considerations and clinical application of Ayaskriti, Louha and Mandura kalpa. Emphasis is given to standard operative procedures, iron based transformations (such as oxidation and complex formation)and therapeutic significance in iron related disorders. It bridges classical ayurvedic concepts with modern pharmaceutical understanding for effective clinical application. • M20U1 SOP and clinical application of Ayaskriti	1	5	10	15	30

	1.1 Ayaskriti. 1.2 Standard Operating Procedure for the preparation of Ayaskriti 1.3 Types (forms) of ayaskriti. 1.4 Method of administration and clinical utility of Ayaskriti. 1.5 Safety concerns of Ayaskriti. • M20U2 SOP and clinical application of Louha kalpa 2.1 Pharmaceutical vistas of Louha Kalpas 2.2 Key chemical considerations in Louha Kalpa 2.3. Pharmacology and clinical utility of Louha kalpa • M20U3 SOP and Clinical application of Mandura Kalpa 3.1 Concept of mandura kalpa and its SOP. 3.2 Types of mandura kalpa based on the method of preparation. 3.3 Significance of go mutra in mandura kalpa 3.4 Clinical application of mandura kalpa.					
		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 Clinical application of Rasoushadhi according to Srotas and in selected challenging clinical conditions	1	5	10	15	30

	This module deals with the significance of rasoushadhis in clinical settings, therapeutic activity of rasoushadhis specific to srotas, Standard Operative Procedure for preparing rasoushadhis which can be applied in various diseases associated with sroto dushti, medical emergencies, various neurological and other chronic diseases • M21U1 Clinical application of Rasoushadhis specific to Srotas 1.1. Concept and rationality of selection and application of Rasoushadhi according to Srotas 1.2. Clinical application of Rasouashdhi in disorders of different Srotas • M21U2 Clinical application of Rasoushadhi in emergency conditions 2.1 Role of Rasoushadhis in Managing Medical Emergencies 2.2 Specific Rasa Yogas among Chaturvidha Rasayana kalpas for Managing Medical Emergencies 2.3 Application of Pottali Kalpa in Emergency Management • M21U3 Rasoushadhi in specific, clinically challenging conditions 3.1 Rational application of Rasoushadhi in cancer 3.2 Application of Rasoushadhi in neurodevelopmental conditions 3.3 Utility of Rasoushadhi in neurodegenerative conditions					
22	M-22 Yogas from different Kalpanas This module deals with Standard Operative Procedures for the preparation of churna kalpana, Vati, Gutika, Guggulu kalpana, Avaleha, Khanda, Sneha kalpana, Sandhana kalpana, with special reference to therapeutic application,	3	15	30	45	90

probable mode of action, analytical profiling, and pharmaceutical development to novel dosage forms

• M22U1 SOP of Vati, Gutika, Guggulu and Varti Kalpas and their therapeutic applications

- 1.1 SOP of selected Vati preparation including packing, storage, and therapeutic applications
- 1.2. SOP regarding preparation of selected formulations from Guggulu Kalpana, including packing, storage, and therapeutic applications
- 1.3. Types of Varti and their SOP
- 1.4. Clinical applications of different Varti
- 1.5. Suppositories and pharmaceutical modifications of Ayurvedic suppositories

• M22U2 SOP and Clinical applications of Avaleha and Khanda kalpana

- 2.1. SOP of Avaleha preparation with suitable Leha yogas
- 2.2. Therapeutic application of different varieties of Avaleha yogas
- 2.3. SOP of Khanda kalpana with suitable Khanda Yogas
- 2.4. Therapeutic application of different varieties of Khanda yogas

• M22U3 SOP of Sneha Kalpana and its clinical significance

- 3.1. Different categories of Sneha with special reference to therapeutic application
- 3.2. Relevance of Avarthita Taila, Taila murchana and Taila Paka with special reference to critical endpoints
- 3.3. SOP of Sneha kalpana in selected formulations
- 3.4. Therapeutic application of selected Ghrita yogas and Taila yogas

• M22U4 SOP and clinical applications of Arka and Dravakam in various disorders

	4.1. SOP for preparing selected Arkas 4.2. Analytical profiling of various yogas from Arka Kalpana 4.3. SOP of preparing various Dravakas 4.4. Analytical Profiling of selected formulations of Dravaka 4.5. Therapeutic applications and method of administration of Dravaka • M22U5 SOP and therapeutic applications of Sandhana Kalpana 5.1. Different and novel fermentation techniques 5.2. SOP of preparing different types of Formulations in Sandhana Kalpana 5.3. Therapeutic applications of selected yogas from Sandhana Kalpana					
		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 SOP and clinical applications of Churna Kalpana(Powder dosage forms) This module deals with standardisation, therapeutic application, analytical profiling and pharmaceutical development of Kshara kalpana, Kshara sutra, Lavanas, Satva kalpana, Arka kalpana, Dravaka and Masi	3	15	30	45	90

	• M23U1 SOP and clinical utility of Churna Kalpana 1.1. Standardisation of various Churna yogas with Standard Operating Procedure 1.2. Therapeutic application of various Churna yogas 1.3. Relevance of Churna kalpana in therapeutics. • M23U2 Standardization, analytical profiling, and clinical application of Kshara 2.1. Relevance of Kshara kalpana and Kshara sutra in therapeutics 2.2.SOP of preparation of Paneeya Kshara and Pratisaraneeya Kshara 2.3.SOP of preparation of Kshara Sutra 2.4. Analytical profiling of Kshara • M23U3 Lavana Kalpana with special reference to pharmaceutico-analytical aspects and therapeutic attributes 3.1. Standard Operating Procedures(SOP) for preparing selected formulations from Lavana Kalpana 3.2. Analytical Profiling of Lavanas 3.3. Therapeutic Applications of Selected Formulations in Lavana Kalpana • M23U4 Satva Kalpana SOP and clinical significance 4.1.SOP for preparing selected Satvas 4.2. Analytical profiling of various yogas from Satva Kalpana 4.3. Therapeutic application of Satva kalpana • M23U5 Therapeutic attributes of Masi Kalpana 5.1. Masi from plant and animal origin 5.2. Pharmacology of Masi 5.3. Activated charcoal in therapeutics 5.4. Clinical applications of Masi					
24	M-24 Therapeutic significance of Topical dosage forms	1	5	10	15	30

	This module deals with the standardisation of ophthalmic preparations, Lepas, Malaharas, Upanahas, Dhupa, Dhoomapana, their analytical profiling, therapeutic applications, and the development of innovative products • M24U1 Ophthalmic, Otic, and Buccal dosage forms and their clinical applications 1.SOP for Ophthalmic, Otic and buccal dosage forms 2.Analytical profiling of various ophthalmic, otic and buccal dosage forms 3.Therapeutic applications of ophthalmic, otic and buccal dosage forms • M24U2 Standardisation of Lepa and Malahara preparations and its application in various disorders 2.1 SOP for the preparation of various Lepas 2.2.Innovative approaches including Patches, Bandages, Bands 2.3.Clinical applications of Lepa and Malahara kalpa • M24U3 Standard Operating Procedure (SOP) for Upanaha, Dhupa, Dhumapana, and Avachurnana Kalpa and their therapeutic applications 3.1. SOP for the preparation of Upanaha, Dhupa, Avachurnana, and the evaluation of their clinical applications 3.2. Anti-microbial activity of Dhupa 3.5. Clinical application of various Dhumapana yogas					
		4	20	40	60	120
		16	80	160	240	480
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)						

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
25	M-25 Artificial intelligence in drug development and Pharmacogenetics; Pharmacogenomics This module describes the role of Artificial Intelligence in drug development. This module also discusses about Pharmacogenetics and pharmacogenomics and their role in drug discovery. This module provides a comprehensive knowledge of the different types of software used in Artificial Intelligence and 3D printed drug delivery systems. • M25U1 Role of Artificial intelligence in drug development 1.1. Introduction to AI in drug development 1.2. AI, machine-based intelligence learning 1.3. Role of AI in Drug discovery and Drug development • M25U2 Types of software used in Artificial intelligence 2.1. Different types of software used in AI 2.2. Data mining and analysing medical records, medication management 2.3. Recent updates	2	10	20	30	60

	• M25U3 3D printed drug delivery system 3.1 Approaches of 3D printing in current drug delivery 3.2. 3D printing in personalized drug delivery 3.3. 3D-Printed Drug Delivery Systems Based on Natural Products • M25U4 Pharmacogenetics and Pharmacogenomics 4.1. Introduction to Pharmacogenetics and Pharmacogenomics along with its importance 4.2. Factors influencing drug response and ADE (Adverse drug events) 4.3. Methods of pharmacogenetics testing • M25U5 Pharmacogenomics in drug discovery 5.1. Benefits of Pharmacogenomics 5.2. Drug Repurposing 5.3. Basis of gene-drug association 5.4. Current status and future perspective of Pharmacogenomics 5.5. Ethical concern					
26	M-26 Pharmacology The primary purpose of this module is to understand the effects of drugs on living organisms and how these effects can be applied to therapeutics. The module covers the information about the drugs, such as the mechanism of action, physiological and biochemical effects (pharmacodynamics), as well as absorption, distribution, metabolism, and excretion (pharmacokinetics), along with the adverse effects, clinical uses, interactions, doses, contraindications, and routes of administration of different classes of drugs. • M26U1 Introduction to Pharmacology 1.1. Introduction to Pharmacology	2	10	20	30	60

1.2. Pharmacodynamics

1.3. Dose-response relationship and factors influencing drug action

• **M26U2 Pharmacokinetics, therapeutic index, and drug interactions**

2.1. Pharmacokinetics (absorption, distribution, metabolism, excretion)

2.2. Therapeutic index and combined effects of drugs

2.3. Adverse drug reaction.

2.4. Drug interactions (pharmacokinetic and pharmacodynamic)

• **M26U3 Pharmacology of drugs that act on the peripheral nervous system**

3.1. Organization and function of ANS (Autonomic Nervous System).

3.2. Neurohumoral transmission, co-transmission, and classification of neurotransmitters.

3.3 Parasympathomimetics, Parasympatholytics, Sympathomimetics, Sympatholytics.

3.4. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

3.5 Local anesthetic agents

• **M26U4 Pharmacology of drugs that act on the central nervous system I**

4.1. Neurohumoral transmission in the C.N.S. special emphasis on the importance of various neurotransmitters, like as GABA, Glutamate, Glycine, serotonin, dopamine.

4.2. General anaesthetics and pre-anaesthetics.

4.3. Sedatives, hypnotics, and centrally acting muscle relaxants.

4.4. Anti-epileptics

• **M26U5 Pharmacology of drugs that act on the central nervous system II**

5.1. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics, and hallucinogens.

5.2. Drugs used in Parkinson's disease and Alzheimer's disease

	5.3. CNS stimulants and nootropics. 5.4. Drug addiction, drug abuse, tolerance, and dependence					
		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
27	M-27 Network pharmacology & Reverse Pharmacology The module Network Pharmacology & Reverse Pharmacology deals with fundamental knowledge of network pharmacology, reverse pharmacology, different computational methods, drug discovery current scenario and future perspectives, and relevant research updates in Network Pharmacology and Reverse Pharmacology • M27U1 Network Pharmacology 1.1. Fundamental knowledge of Network pharmacology 1.2. Network pharmacology concepts 1.3. Computational methods 1.4. Applications	2	10	20	30	60

	1.5. Research updates on Network pharmacology • M27U2 Reverse Pharmacology 2.1. Introduction, Definition of Reverse Pharmacology, History, and Scope 2.2. Drug Discovery Current Scenario, Challenges, and Future Perspective 2.3. Reverse pharmacology for herbal drug-based modern medicines 2.4. Research updates on Reverse pharmacology					
28	M-28 Pharmaceutical Quality Assurance The module Pharmaceutical Quality Assurance provides a comprehensive knowledge on various aspects of Quality Assurance and Quality Management concepts, Personnel Responsibilities, Containers, Packing materials, types of packing, GLP, Document maintenance in the pharmaceutical industry along with the important aspects like cGMP, QC tests, ICH guidelines, ISO, and regulatory affairs. • M28U1 Quality Assurance and Quality Management concepts 1.1. Introduction to Quality Assurance and Quality Management concepts 1.2. Definition and concept of Quality control, 1.3. Quality assurance and GMP 1.4. Total Quality Management (TQM) 1.5. ICH Guidelines 1.6. Brief overview of Pharmaceutical industry guidelines for Quality, Safety, Efficacy and Multidisciplinary (QSEM) 1.7. Overview of ISO 9000 & ISO14000 1.8. Steps for registration of NABL accreditation • M28U2 Personnel Responsibilities 2.1. Organization and personnel	2	10	20	30	60

2.2. Personnel responsibilities, training, hygiene, and personal records. 2.3. Premises: Design, construction, and plant layout, maintenance, sanitation, environmental control, utilities, and maintenance of sterile areas, control of contamination. 2.4. Equipment and raw materials: Equipment selection, purchase specifications, maintenance, and purchase specifications and maintenance of stores for raw materials. • M28U3 Containers, Packing materials 3.1. Types of Packaging 3.2. Packaging materials 3.3. Container types and closures 3.4. Packaging and stability 3.5. Regulatory aspects 3.6. Quality Control 3.7. Smart Packaging • M28U4 Good Laboratory Practices 4.1. GLP Principles and Requirements 4.2. GLP documentation 4.3. Regulatory compliance 4.4. Audit procedures • M28U5 Document maintenance in pharmaceutical industry 4.1. Documentation related to Grievances and Redressal 4.2. Complaints and evaluation of complaints, Handling of returned goods, recalling, and waste disposal. 4.3. Document maintenance in the pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review, Quality documentation, Reports and documents, distribution records.					
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		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
29	M-29 Pharmacy Practice The module Pharmacy Practice encompasses comprehensive knowledge of various aspects of Hospital Pharmacy and Community Pharmacy, Therapeutic Drug Monitoring, and the Pharmacy and Therapeutic Committee. Here, students are required to learn multiple skills, including drug distribution, drug information, and therapeutic drug monitoring, for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable, safe medication, and patient counselling for improved patient care in the community setting. • M29U1 Hospital Pharmacy and Community Pharmacy 1.1. Hospital and its organization 1.2. Definition, Classification of Hospital 1.3. Hospital pharmacy and its organization 1.4. Functions of hospital pharmacy 1.5. Community Pharmacy 1.6. Organization and structure of retail and wholesale drug stores	2	10	20	30	60

	• M29U2 Therapeutic Drug Monitoring 2.1. Drug distribution system in a hospital 2.2. Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, dispensing of drugs to ambulatory patients, and dispensing of controlled drugs. 2.3. Hospital formulary 2.4. Therapeutic drug monitoring 2.5. Factors to be considered during the Therapeutic Drug Monitoring 2.6. Medication adherence 2.7. Patient medication history interview 2.8. Community pharmacy management 2.9. Financial, materials, staff, and infrastructure requirements. • M29U3 Pharmacy and therapeutic committee 3.1. Introduction to Pharmacy and Therapeutic Committee 3.2. Drug information services					
30	M-30 Pharmaceutical Microbiology The Module Microbiology deals with Introduction to microbes with applications of sterilization, Sources of contamination, Types of spoilage, and use of antimicrobial agents • M30U1 Introduction to microbes with applications of sterilization 1.1. Identification of bacteria using staining techniques (simple, Gram's & Acid-fast staining) and biochemical tests (IMViC). 1.2. Study of principles, procedures, merits, demerits, and applications of physical, chemical, gaseous, radiation, and mechanical methods of sterilization.	2	10	20	30	60

	1.3. Evaluation of the efficiency of sterilization methods. 1.4. Equipment employed in large-scale sterilization and Sterility indicators • M30U2 Sources of contamination 2.1. Designing an aseptic area. 2.2. Study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. 2.3. Principles and methods of different microbiological assay methods. • M30U3 Types of spoilage and use of antimicrobial agents 3.1. Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, assessment of microbial contamination and spoilage. 3.2. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations					
		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 Regulatory Acts and Rules applicable to Ayurvedic Drugs This module, “Regulatory Acts and Rules Applicable to Ayurvedic Drugs,”	3	15	30	45	90

provides an in-depth understanding of the regulatory framework governing Ayurvedic drugs, focusing on the Drugs and Cosmetics Act, 1940, and Rules, 1945. Additionally, it covers other relevant acts, such as the Narcotic Act, Pharmacy Act, and Drug and Magic Remedies Act, including recent amendments.

• M31U1 Chapter I of the Drugs and Cosmetics Act, 1940 and Rules 1945

- 1.1. Introduction to 'Drugs and Cosmetic Act, 1940; and 1945' and definitions
- 1.2. Prescribed Books on Ayurveda, Siddha, and Unani Drugs: The First Schedule

• M31U2 Chapter II - Regulatory Bodies

- 2.1. The Drugs Technical Advisory Board (DTAB)
- 2.2. The Central Drugs Laboratory (CDL)
- 2.3. The Drugs Consultative Committee (DCC)

• M31U3 Chapters III, IV, and IV-A - Regulation of Drugs and Cosmetics

- 3.1. Chapter III: Standards of quality
- 3.2. Misbranded, adulterated, and spurious drugs and cosmetics
- 3.3. Prohibition of import of certain drugs or cosmetics
- 3.4. Manufacturing, Labelling, and Sale of Drugs and Cosmetics (Chapter IV-A)
- 3.5. Standards of quality for drugs and cosmetics (Sections 16 and 16A)
- 3.6. Prohibition of manufacture and sale of certain drugs and cosmetics (Sections 18 and 19)

• M31U4 Schedules to Drugs and Cosmetics Rules related to ASU drugs and cosmetics

- 4.1. Good Manufacturing Practices (GMP) for ASU Medicines (Schedule T) and Poisonous Substances (Schedule E(1))
- 4.2. Prescription and Safety Requirements (Schedules H, G, X) and Pharmacological Information (Schedule Y)

• M31U5 Pharmaceutical observation of drugs and cosmetics ASU drugs

	5.1. Shelf life and stability of ASU drugs: recent amendments 5.2. Use of Preservatives in ASU drugs 5.3. Packaging and labelling requirements for ASU drugs • M31U6 Miscellaneous Regulatory Acts related to drugs and cosmetics 6.1. Narcotic and Psychotropic Substances Act 1985 6.2. Factories Act, 1948 6.3. Industries Act, 1951 6.4. Biological Diversity Act 2002 6.5. Consumer Protection Act 1986 6.6. Drugs and Magic Remedies Act, 1954 6.7. Medicinal and Toilet Preparations Act, 1955 6.8. Opium Act, 1857 6.9. Pharmacy Act 1948 6.10. Recent Amendments in D & C Act concerning Ayurvedic Drug Industry					
32	M-32 Entrepreneurship and Start-Ups The module Entrepreneurship and Start-Ups designed to impart knowledge and skills necessary to train the scholars on dynamics of motivation and concepts of entrepreneurship along with Startup India initiative, thereby providing platform to think different and come up with innovative projects. • M32U1 Entrepreneurship and Startup 1.1. Introduction to Entrepreneurship and Start-ups 1.2. MSMED Act and its Process of Registration and Role of Department for Promotion of Industry and Internal Trade(DPIIT) and Bharat Startup Knowledge Access Registry (BHASKAR) 1.3. Types of Enterprises and Role of Enterprises in National and Global Economy 1.4. Government Policies, Schemes, and Institutional Support for Entrepreneurship	1	5	10	15	30

	• M32U2 Process of entrepreneurship development 2.1. Need and the process of entrepreneurship development. 2.2. Dynamics of Entrepreneurial Motivation. 2.3. Developing Entrepreneurial Competencies • M32U3 Project Proposal for new Invention/startup 3.1. Challenges and the feasibility report of the Startups 3.2. Planning, resource mobilisation, and implementation of a start-up project • M32U4 Intellectual Property Rights and Patents 4.1. Introduction to IPR and Patents 4.2. Indian and international patent laws, proposed amendments as applicable to herbal/natural products and processes. 4.3. Procedure for patent filing. 4.4. Geographical Indication and Copyright					
		4	20	40	60	120
		16	80	160	240	480
		64	320	640	960	1920

Table 3 : Modules - Unit - Module Learning Objectives and Session Learning Objective- Notional Learning Hours- Domain-Level- TL Methods

Paper No : 1 Rasashastra(Iatrochemistry) – Principles and Practices						
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 : Chronological Development and Taxonomy of Rasa Dravyas						
Module Learning Objectives (At the end of the module, the students should be able to) 1. Discuss the philosophical relevance and chronological development of Rasashastra, 2. Integrate the development of Iatrochemistry with modern chemistry 3. Differentiate Rasadravyas as per different ancient classics, and Mendeleev Periodic Table 4. Discuss the Sandigdha, Anupalabdha Rasadravyas, and authenticate ideal substitutes						
M 1 Unit 1 Chronological Development and Overview of Rasashastra 1.1.Philosophical Relevance of Rasashastra 1.2.Chronological Development of Rasashastra 1.3.Integration of the development of Iatrochemistry with modern chemistry References: 52,65,66,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,112,113,114,116						
3A	3B	3C	3D	3E	3F	3G

CO 1,CO 2	Discuss the philosophical relevance of Rasashastra and historical evidence till the 6th century AD	1	Lecture	CC	Knows-how	L&GD,L &PPT
CO 1,CO 2	Describe the chronological development of Rasashastra from the 6th Century AD to the medieval period	1	Lecture	CC	Knows-how	PrBL,BS, DIS,D
CO 1,CO 2	Discuss the chronological development of Rasashastra after the medieval period	1	Lecture	CAN	Knows-how	DIS,BS
CO 1,CO 2	Integrate the development of Iatrochemistry with modern chemistry	1	Lecture	CC	Knows-how	LS,DIS
CO 1,CO 2	Construct a chronological tree of Rasashastra and its integration with other medical traditions	5	Experiential-Learning 1.1	PSY-ADT	Shows-how	BS,PrBL, DIS
M 1 Unit 2 Taxonomy of Rasadravyas 2.1 Taxonomy of Rasadravyas 2.2 Concepts and justification about division of Rasadravyas 2.3 Mendeleev periodic table References: 61,93,94,95,96,97,98,99,100,101,103,104,105,106,107,108,109,110,112,113,115,116						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Elaborate classification of Rasadravyas as per different ancient classics	1	Lecture	CAN	Knows-how	L&GD,DIS
CO 1,CO 2	Justify the division of Rasadravyas	1	Lecture	CC	Knows-how	ML,BS,Mnt,DIS
CO 1,CO 2	Discuss the critics of the classification of Rasadravya	1	Lecture	CC	Knows-how	DIS,ML, DA,C_L, BS
CO 1,CO 2,CO 8	Demonstrate the application of the Mendeleev Periodic table in mapping Rasadravyas	5	Practical Training 1.1	PSY-GUD	Shows-how	DIS,BS,L &PPT ,D

CO 1,CO 2,CO 8	Identify and analyse selected metals and minerals with the periodic table elements	5	Experiential-Learning 1.2	CAN	Shows-how	PER
M 1 Unit 3 Geological/mineralogical identification of Rasadravyas 3.1 Grahya-Agrahyata of Rasadravyas 3.2 Geological/Mineralogical identification of Rasadravyas References: 59,61,89,93,94,95,96,97,98,99,100,101,102,103,104,105,110,116,117						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3,CO 4	Discuss classical parameters for differentiating acceptable and non-acceptable Rasadravya	1	Lecture	CAP	Knows-how	DIS,ML
CO 2,CO 3,CO 4,CO 7,CO 8	Apply geological/mineralogical characters for the identification of Rasadravya	1	Lecture	CAN	Knows-how	PBL,PrBL,DIS,BS,IBL
CO 2,CO 3	Demonstrate the comparison and analyze the classification of Rasa Dravyas	5	Practical Training 1.2	PSY-GUD	Shows-how	D,DL
CO 2,CO 3,CO 8	Demonstrate Geological/Mineralogical identification of Rasadravyas	5	Practical Training 1.3	PSY-GUD	Shows-how	DIS,DL,ML,BS,D
CO 1,CO 2,CO 3,CO 4	Recognise Rasadravya based on their Graahyatva-Agrahyatva	5	Experiential-Learning 1.3	PSY-MEC	Does	PrBL
CO 1,CO 2,CO 3,CO 4,CO 8	Identify Rasadravya using geological/mineralogical characters	5	Experiential-Learning 1.4	PSY-MEC	Does	DIS,PrBL,PER,DA
M 1 Unit 4 Overview of Sandigdha, Anupalabdha, Krutrima, and Pratinidhi Dravyas in the Context of Rasa Dravya 4.1 Sandigdha (Controversial) Rasadravya 4.2 Anupalabdha (Not Available) and Krutrima (Artificial) Rasadravya 4.3 Pratinidhi (Substitute) Rasadravya References: 52,58,59,61,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,109,110						

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3	Discuss Sandigdha, Anupalabdha, Krutrima, and Pratinidhi Dravyas in the Context of Rasa Dravya	1	Lecture	CC	Knows-how	DIS,CBL,LS,BS,L &GD
CO 1,CO 2,CO 3,CO 4,CO 8	Demonstrate the Krutrima and Pratinidhi Rasadravyas	5	Practical Training 1.4	PSY-GUD	Shows-how	DL,DIS,D
CO 1,CO 2,CO 3,CO 8	Identify and analyse Sandigdha and Anupalabdha Rasadravyas and propose suitable alternatives	6	Experiential-Learning 1.5	PSY-SET	Shows-how	PER,PrBL,DIS,PBL

Practical Training Activity

Practical Training 1.1 : Demonstration of the application of the Mendeleev Periodic table in mapping Rasadravyas

The teacher will allot each student at least one category from the classification of Rasadravya or one drug from each category. Each student will map minerals/Metals to the Periodic Table and search the elemental properties of minerals/metals mentioned in Rasashastra. Students will locate these metals on the Mendeleev Periodic Table, noting their atomic numbers, groups, and periods. Each student will compare and analyze the traditional name with the Periodic table, along with other properties, etc.

Practical Training 1.2 : Demonstration of different Rasadravyas mentioned in different classics and analysis of the classification of Rasa Dravyas

The teacher will demonstrate different Rasadravyas mentioned in different classics based on classical Grahya- Agrahya Lakshanas, compare them, and analyze. The teacher helps the students to identify similarities, differences, and the evolution of thought in Rasashastra and its dravyas.

Practical Training 1.3 : Geological Mineralogical Identification of Rasadravyas

The teacher will demonstrate the identification of selected Rasadravya using geological/ mineralogical characters.

Practical Training 1.4 : Demonstration of Krutrima and Pratinidhi Rasadravyas

The teacher will demonstrate the preparation of a Krutrima Rasadravya and discuss the steps involved, the rationale behind the process, and the therapeutic benefits of the resulting product. The teacher will encourage students to reflect on the challenges of identifying Krutrima and Pratinidhi substances and the significance of these classifications in ensuring the integrity of Rasashastra formulations.

Experiential learning Activity	
Experiential-Learning 1.1 : Preparing a chronological tree of Rasashastra and its integration with other medical traditions	
Each student will be asked to create a chronological timeline highlighting key texts and developments in Rasashastra. They will compare and contrast excerpts from classical texts to understand the evolution of alchemical practices. Students will investigate the influence of Rasashastra on contemporary Ayurvedic practices and its integration with other medical traditions. Each student will present the findings and discuss	
Experiential-Learning 1.2 : Integration of the selected metals and minerals with the periodic table elements	
The teacher will allot each student at least one category from the classification of Rasadravya or one drug from each category. Each student will map minerals/Metals to the Periodic Table and search the elemental properties of minerals/metals mentioned in Rasashastra. Students will locate these metals on the Mendeleev Periodic Table, noting their atomic numbers, groups, and periods. Each student will compare and analyze the traditional name with the Periodic table, along with other properties, etc.	
Experiential-Learning 1.3 : Recognise Rasadravya based on their Graahyatva-Agrahyatva	
The teacher will allot each student at least one category from the classification of Rasadravya or one drug from each category. The student will identify the Rasadravya based on classical characters and find out the ideal characters for acceptance (Grahya)	
Experiential-Learning 1.4 : Identification of Rasadravya using geological/mineralogical characters	
The teacher will allot each student at least one category from the classification of Rasadravya or one drug from each category. The student will identify the Rasadravya based on geological/mineralogical characteristics	
Experiential-Learning 1.5 : Exploring Sandigdha and Anuplabhdha Rasadravyas and propose suitable alternatives	
Each student will collect different samples of Sandigdha Rasadravyas and identify them with labelling. Student will also explore present scenarios where certain Rasadravyas are absent or unavailable, with proposed alternative substances or modifications to compensate for the absence, drawing from their knowledge of Rasashastra principles	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade	4

point as per Table 6C.

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

1. LAQ related to chronological development of Rasashastra with special reference to Rasadravyas.
2. Approach to conduct a comparative study of different Rasadravyas with Mendeleev periodic table.
3. Create a presentation that explains geological/ mineralogical identification of Rasadravyas.
4. Each student will investigate and come with atleast two example of Sandigdha, Anupalabdha, Krutrima, and Pratinidhi Dravyas in the Context of Rasa Dravya

OR

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

and

Any experiential learning method in converted form can be taken for 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
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Module 2 : Puta and Samskara (Transformative processes of drug manufacturing)

Module Learning Objectives

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

1. Describe the definition, significance, construction, and design of traditional Puta
2. Elaborate on the different theories and laws of thermodynamics with traditional Puta
3. Describe the principles and significance of Jarana, Amritikarana, Lohitikarana, Satva, and Druti procedures
4. Integrate the principles of classical drug manufacturing (Samskara-transformative process) with modern techniques

M 2 Unit 1 Puta and Law of thermodynamics
 1.1 Definition, Significance and Classification of Puta
 1.2 Laws of thermodynamics, Thermochemistry, Griffith theory, Collision theory, etc.
 1.3 Heating devices and fuels, with detailed knowledge about temperature, duration, designing and construction of different Puta

References: 93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,112,113,118

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4,CO 7	Explore the traditional concept of Puta, discussing its definition, significance, and classification in the context of Ayurvedic pharmaceutical practices.	1	Lecture	CC	Knows-how	L,L&PPT ,L&GD
CO 1,CO 2,CO 4,CO 7,CO 8	Examine the modern applications and relevance of Puta in contemporary pharmaceutical processing, integrating traditional knowledge with modern technology.	1	Lecture	CE	Know	DIS,BL,L ,L&PPT
CO 5,CO 7,CO 8	Explain the laws of thermodynamics (Zeroth, First, Second, Third), the law of thermochemistry, Griffith's theory, and Collision theory	1	Lecture	CC	Knows-how	DIS,BL,L &PPT
CO 1,CO 4,CO 7,CO 8	Demonstrate and compare the temperature pattern and total duration of different traditional Puta with EMF	5	Practical Training 2.1	PSY-GUD	Shows-how	DIS,DL,J C,D
CO 1,CO 4,CO 7,CO 8	Perform comparison of Traditional and Modern Puta Methods: Observing and Analyzing Temperature Patterns and Duration.	5	Experiential-Learning 2.1	PSY-MEC	Shows-how	PrBL
CO 1,CO 4,CO 7,CO 8	Explore Thermal Dynamics in Traditional Puta Systems: An Experiential Investigation of Fuel Variations, Temperature Patterns, and Thermodynamic Principles	5	Experiential-Learning 2.2	PSY-MEC	Does	PER,DIS, PrBL,L& PPT

M 2 Unit 2 Concept, understanding, application, SOPs and chemical changes of Jarana, Amritikarana and Lohitikarana
 2.1 Principle and Significance of Jarana Procedures
 2.2 Application of Amritikarana and Lohitikarana procedures in bhasma preparation
 2.3. Standard Operating Procedures (SOP) and Chemical Changes of Jarana, Amritikarana, and Lohitikarana

References: 95,96,98,99,100,101,102,103,104,105,106,107,119,120,121,122,123,124,125

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Discuss the fundamental principles and significance of Jarana, Amritikarana, and Lohitikarana procedures in the preparation of bhasmas.	2	Lecture	CAN	Knows-how	L&PPT,DIS
CO 1,CO 7	Demonstrate the art of Gandhaka Jarana: A Practical Exploration of the Rasa Jarana Process, Understanding its Role and Significance in Rasashastra	5	Practical Training 2.2	PSY-GUD	Shows-how	D
CO 1,CO 2,CO 4,CO 8	Demonstrate Amritikarana and Lohitikarana: Traditional Methods for Mica Processing in Rasashastra	5	Practical Training 2.3	PSY-GUD	Shows-how	DL
CO 1,CO 2,CO 4,CO 7,CO 8	Perform an experiential Investigation of Amritikarana and Lohitikarana Procedures, Exploring Safety, Efficacy, and Principles of Transformation.	4	Experiential-Learning 2.3	PSY-GUD	Shows-how	TPW,DIS

M 2 Unit 3 Concept, understanding, application, SOPs (Standard Operating Procedures) and chemical changes of Satva and Druti procedures

3.1 Principle and Significance of Satva and Druti Procedures

3.2 Application and analysis of Satva and Druti procedures

3.3.SOP and chemical changes of Satva and Druti

References: 93,94,95,96,97,98,99,100,101,102,103,104,105

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4,CO 8	Discuss the principles, significance, and applications of Satva procedures within the context of Ayurvedic pharmacy and modern pharmaceutical practices	1	Lecture	CAP	Knows-how	DIS,BS,ML,L&PPT
CO 1,CO 2,CO 7,CO 8	Describe the principles, significance, and apply Druti procedures within the context of Ayurvedic pharmacy	1	Lecture	CAP	Knows-how	L&GD,IBL,DIS
CO 1,CO 2,CO	Demonstrate the procedure of Satvapataana	5	Practical	PSY-	Shows-	DIS,PrBL

7			Training 2.4	GUD	how	
CO 1,CO 2,CO 7,CO 8	Perform and analyse the Satva Patana procedure.	2	Experiential-Learning 2.4	PSY-GUD	Shows-how	DIS,PrBL
M 2 Unit 4 Samskara (Principles of Transformative processes of drug manufacturing) 4.1 Application of Toya Sannikarsha (Processing with water) and Agni Sannikarsha (Processing with Heat), Toyagni Sannikarsha (Processing with water and Heat) in drug manufacturing 4.2 Shaucha and Manthana (churning) 4.3 Vasana (process of infusing aroma), and Bhavana (Effect of Levigation / Trituration) References: 237,238,239,241,243,244						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4,CO 7,CO 8	Integrate and apply classical Ayurvedic manufacturing principles, including water, heat, and combined processing, cleaning, churning, proximity, and trituration effects.	1	Lecture	CC	Knows-how	L&GD,DIS,BS
CO 1,CO 2,CO 4,CO 8	Apply Time-Tested Principles of Classical Drug Manufacturing: by integrating Toya Sannikarsha, Agni Sannikarsha, Toyagni Sannikarsha, Shaucha, and Manthana to Optimize Pharmaceutical Quality, Safety, and Efficacy.	2	Experiential-Learning 2.5	PSY-ADT	Shows-how	PER,DIS
M 2 Unit 5 Influence of Desha (place) and Kala(time and seasonal factors) of drug qualities 5.1. Influence of Desha (geographical area and place of manufacturing) on drug quality 5.2. Influence of Kala (processing time, season, and maturity of herbs) on drug quality References: 239,240,241,242,243,244,331,332,333,334,335,336,337,338,339,340,341,342						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 3,CO 4,CO 7,CO 8	Description of the influence of Desha (geographical area) and Kala (time and seasonal factors) on the quality of Ayurvedic drugs, including the impact of geographical location, climate, and seasonal variations on drug efficacy and safety.	1	Lecture	CC	Knows-how	L&GD,L&PPT,DIS
CO 1,CO 3,CO	Perform A Hands-on Investigation of Geographical and Temporal Influences on drug	2	Experiential-	PSY-	Shows-	DIS,PrBL

7,CO 8	quality: Desha–Kala in Pharmaceutical Manufacturing		Learning 2.6	MEC	how	
M 2 Unit 6 Kalaprakarsha- Processing with/Effect of specific time exposure and Bhajana (processing vessel) 5.1 Knowledge of Kalaprakarsha (Time taken for drug processing) 5.2 Knowledge of Bhajana (vessels used for manufacturing) 5.3.Environmental and Temporal Influences on Drug Quality and Processing References: 237,243,432,433,434,435,436						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 4,CO 7,CO 8	Discuss the concepts of Kalaprakarsha (processing with specific time exposure) and Bhajana (processing vessels) in Ayurvedic pharmaceutical processing, including the significance of processing time, vessel material, and other temporal factors on drug quality and efficacy	1	Lecture	CC	Know	L&PPT ,L
CO 1,CO 4,CO 7	Demonstrate and analyze the role of Vasana and Bhavana to Optimize Pharmaceutical Quality, Safety, and Efficacy	4	Experiential-Learning 2.7	PSY-GUD	Shows-how	PrBL
CO 1,CO 2,CO 7,CO 8	Demonstrate the effect of Kalaprakarsha and Bhajana in Pharmaceutical Processing, Analyzing Processes and Findings to Optimize Quality, and stability	2	Experiential-Learning 2.8	PSY-GUD	Shows-how	D,PER
Practical Training Activity						
Practical Training 2.1 : Demonstration and comparison of the temperature pattern and total duration of different traditional Puta with EMF						
The teacher will demonstrate a traditional Puta method and have students observe the temperature pattern and duration. Then, the teacher will replicate the Puta using a modern furnace, allowing students to compare and contrast the temperature patterns and durations between traditional and contemporary methods.						
Practical Training 2.2 : Demonstration of the art of Gandhaka Jarana: A Practical Exploration of the Rasa Jarana Process, Understanding its Role and Significance in Rasashastra						
The teacher will demonstrate the Gandhaka Jarana procedure using a suitable method and explain the role and significance of Rasa Jarana. Students will then conduct the practical and present their findings at the end, highlighting their understanding of the process.						

Practical Training 2.3 : Demonstration of Amritikarana and Lohitikarana: Traditional Methods for Mica Processing in Rasashastra

The teacher will demonstrate the procedures of Abhraka Amritikarana and Abhraka Lohitikarana using a selected method. Students will observe, record their observations, and present their findings and insights at the end of the practical.

Practical Training 2.4 : Demonstration and Observation of Satva Patana

The teacher will select any one ore sample used in Rasashastra and demonstrate the procedure of Satva Patana. The students will observe and present their findings at the end of the practical.

Experiential learning Activity**Experiential-Learning 2.1** : Hands-on Comparison of Traditional and Modern Puta Methods: Observing and Analyzing Temperature Patterns and Duration

Each student will go through the different laws of thermodynamics and relate with traditional Puta and understand the concept of heating and energy. Student will analyse and monitor the temperature at various points within the Puta and Sharava Samputa. Then compare the observed data with theoretical predictions based on thermodynamic principles.

Experiential-Learning 2.2 : Exploring Thermal Dynamics in Traditional Puta Systems: An Experiential Investigation of Fuel Variations, Temperature Patterns, and Thermodynamic Principles

The teacher will assign a unique Puta to each student, asking them to utilize different fuel materials and observe the resulting temperature patterns. Students will present their findings using graphical representations.

Additionally, students will explore the laws of thermodynamics and relate them to traditional Puta, gaining insight into heating and energy concepts. They will also analyze and monitor temperature fluctuations at various points within the Puta and Sharava Samputa.

Experiential-Learning 2.3 : Perform an experiential Investigation of Amritikarana and Lohitikarana Procedures, Exploring Safety, Efficacy, and Principles of Transformation.

The teacher will allot each student different practicals for Amritikarana and Lohitikarana procedures. Through hands-on experimentation, students will investigate Amritikarana and Lohitikarana procedures, exploring the dynamics of transformation and critically evaluating the interplay between transformational principles, safety, and efficacy, culminating in a class presentation.

Experiential-Learning 2.4 : Performing and analyzing the Satva Patana procedure.

The teacher will allot each student with different ore samples mentioned in Rasashastra. The students will perform Satva Patana of the given sample following SOP, observe, and record the findings. The findings will be presented and discussed.

Experiential-Learning 2.5 : Application of Time-Tested Principles of Classical Drug Manufacturing: by integrating Toya Sannikarsha, Agni Sannikarsha, Toyagni Sannikarsha, Shaucha, and Manthana to Optimize Pharmaceutical Quality, Safety, and Efficacy.

Each student will search for and perform practicals related to Toya Sannikarsha (processing with water), Agni Sannikarsha (processing with heat), Toyagni Sannikarsha (processing with water and heat), Shaucha (cleaning), Manthana (churning). After the procedure, they will analyze each process and findings, correlating them with different principles of manufacturing to enhance quality, safety, and efficacy, and present their findings in a class presentation.

Experiential-Learning 2.6 : Exploring the Interplay of Desha and Kala on Pharmaceutical Quality: A Hands-on Investigation of Geographical and Temporal Influences on Drug Manufacturing, Analyzing Processes and Findings to Enhance Quality, Safety, and Efficacy

Each student will research and conduct practicals investigating the impact of Desha (geographical location and manufacturing site) and Kala (processing time, seasonal variations, and herb maturity) on pharmaceutical quality. Following hands-on experience, students will analyze the processes and findings, correlating them with manufacturing principles to enhance quality, safety, and efficacy, and present their conclusions in a class presentation.

Experiential-Learning 2.7 : Develop Mastery of Classical Drug Manufacturing: Integrating Time-Tested Principles of Vasana and Bhavana to Optimize Pharmaceutical Quality, Safety, and Efficacy

Each student will search for and perform practicals related to Vasana (infusion of aroma and effect of proximity), and Bhavana (effect of levigation/trituration). After the procedure, they will analyze each process and findings, correlating them with different principles of manufacturing to enhance quality, safety, and efficacy, and present their findings in a class presentation.

Experiential-Learning 2.8 : Demonstration of the effect of Kalaprakarsha and Bhajana in Pharmaceutical Processing, Analyzing Processes and Findings to Optimize Quality, and stability

Each student will conduct practical on Kalaprakarsha (investigating the effect of specific time exposure) and Bhajana (examining the influence of processing vessels). Following hands-on experience, students will analyze each process, correlate findings with manufacturing principles, and present their insights in a class presentation to enhance understanding of quality, stability and efficacy.

Modular Assessment

Assessment method

Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various

Hour

4

assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

1. Viva
2. Quiz
3. Interaction
4. Class presentation

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

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/ 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
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Module 3 : Parada (Mercury) and Its Processing: Ancient wisdom and Scientific advances

Module Learning Objectives

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

1. Describe the ancient and contemporary perspectives of Parada (Mercury)
2. Perform and analyse the Samanya Shodhana, Vishesha Shodhana, and procedures of Parada processing (Ashta Samskara)
3. Discuss the Physicochemical properties and pharmacology of mercury and mercurial compounds

4. Describe the mercury poisoning and its management by the ancient and contemporary approaches

M 3 Unit 1 Parada: Ancient and Contemporary Perspectives on Its Shodhana and Underlying Principles 1.1 Ancient & Contemporary knowledge of Parada/
Mercury

1.2 Parada Dosha, Shodhana(Purification) of Parada and its significance

1.3 Principles of Parada Jarana and Parada Murcchana

1.4 Utility of Parada Bandha

References: 93,94,95,96,97,98,101,102,103,109,113,115,116,127

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3,CO 8	Describe the ancient and contemporary perspectives of Parada (Mercury)	1	Lecture	CC	Knows-how	L&PPT ,L
CO 1,CO 2,CO 6	Discuss the processes related to Parada and their significance	1	Lecture	CC	Know	L&GD,L _VC,L&P PT
CO 1,CO 2,CO 5,CO 7,CO 8	Discuss the rationale behind Samanya and Vishesha Shodhana	1	Lecture	PSY-GUD	Knows-how	DIS,L&P PT ,BS
CO 1,CO 2,CO 5,CO 8	Describe the scientific basis of Parada Jarana, Murcchana, and Bandha	1	Lecture	CC	Knows-how	L,L&PPT
CO 1,CO 2,CO 4,CO 7	Demonstrate Samanya and Vishesha Shodhana procedures of Parada	7	Practical Training 3.1	PSY-GUD	Shows-how	DL
CO 1,CO 2,CO 4,CO 7	Perform the Parada Jarana, Parada Murchana and and Bandhana processes	5	Practical Training 3.2	PSY-GUD	Shows-how	BS,PER, DIS
CO 1,CO 7	Perform the Samanya Shodhana of Parada	3	Experiential-	PSY-	Shows-	PrBL

			Learning 3.1	GUD	how	
CO 1,CO 2,CO 7	Perform the Vishesha Shodhana procedures of Parada	3	Experiential-Learning 3.2	PSY-MEC	Does	PrBL
M 3 Unit 2 Parada Ashta Samskara and Ashtadasha Samskara 2.1 Parada Samskara with research updates 2.2 Pharmaceutical equipment design for Parada Ashta Samskara 2.3 Hands-on experience of Parada Ashta Samskara References: 52,58,61,93,94,95,97,98,101,104						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 7	Describe and discuss the utility of Ashtadasha Samskara	2	Lecture	CC	Knows-how	L&GD,REC
CO 5,CO 7,CO 8	Describe the design of pharmaceutical equipment to carry out Parada Ashta Samskara	1	Lecture	CC	Knows-how	BS,PSM,DIS,L&GD
CO 1,CO 2,CO 7	Demonstrate the Parada Samskara procedures- Swedana, Mardana, Murchana, and Utthapana	8	Practical Training 3.3	PSY-GUD	Shows-how	D,DIS
CO 1,CO 2,CO 4,CO 7	Elaborate and perform the Parada Ashta Samskara procedures- Patana, Bodhana, Niyamana and Deepana	10	Experiential-Learning 3.3	PSY-GUD	Shows-how	DIS,PrBL
M 3 Unit 3 Physico-chemical properties and pharmacology of mercury and mercurial compounds 3.1. Mercury metallurgy 3.2. Stoichiometry of mercury 3.3. Pharmacodynamics and pharmacokinetics of mercury and mercurial products References: 127,128,129,130,131,132,133,134,135,136,137,138						
3A	3B	3C	3D	3E	3F	3G
CO 4,CO 5,CO	Describe and elaborate on the metallurgy and stoichiometry of mercury	1	Lecture	CAN	Knows-	L&PPT

7,CO 8					how	,BL
CO 7,CO 8	Compare and analyze the Pharmacodynamics and pharmacokinetics of mercury and mercurial products	5	Experiential-Learning 3.4	PSY-MEC	Shows-how	CBL,DIS,PrBL
M 3 Unit 4 Mercury toxicity, ADR and its management 4.1 Mercury poisoning and its types 4.2 Ancient and Contemporary knowledge about the Treatment of Mercury poisoning References: 127						
3A	3B	3C	3D	3E	3F	3G
CO 7,CO 8	Describe the mercury poisoning and analyze its mechanism	1	Lecture	CAN	Knows-how	L&PPT, L&GD
CO 5,CO 6,CO 7,CO 8	Describe the antidotes for mercury poisoning and its possible treatment by ancient and contemporary knowledge	1	Lecture	CAP	Knows-how	IBL,DIS, L&PPT
CO 7,CO 8	Analyse mercury toxicity and ADR incidences	5	Experiential-Learning 3.5	PSY-GUD	Shows-how	CBL,PBL
Practical Training Activity						
Practical Training 3.1 : Demonstration of Samanya and Vishesh Shodhana procedures of Parada						
The teacher will demonstrate to each student the Samanya and Vishesh Shodhana of Parada by one reference. The teacher will help the students to observe the changes in the Parada before and after Shodhana, along with different stages of the process.						
Practical Training 3.2 : Parada Jarana, Parada Murchana and Bandhana processes						
The teacher will demonstrate the Parada Jarana, Parada Murchana Bandhana by any one method. The students will note down the observations and record the findings						
Practical Training 3.3 : Demonstration of the Parada Samskara procedures- Swedana, Mardana, Murchana, and Utthapana						
The teacher will demonstrate the selected procedures of Parada Samskara like, Swedana, Mardana, Murchana, and Utthapana. The observations, like changes in the Parada, total duration, temperature range, and yield, will be noted down by the students. Following this, the students will perform these Samskaras under the direct observation of						

the teacher, record their findings, and discuss.

Experiential learning Activity

Experiential-Learning 3.1 : Samanya Shodhana of Parada

The teacher will allot each student to perform the Samanya Shodhana of Parada following references other than the one that is not taught during practical hours. The students will record the observations and present their findings, and discuss

Experiential-Learning 3.2 : Vishesha Shodhana procedures of Parada

The teacher will allot each student to perform the Vishesha Shodhana of Parada following references other than the one that is not taught during practical hours. The students will record the observations and present their findings, and discuss

Experiential-Learning 3.3 : Performance of the Parada Ashta Samskara procedures- Patana, Bodhana, Niyamana, and Deepana

Each student or group will practically explore and perform the Samskaras of Parada like, Patana, Bodhana, Niyamana, and Deepana. The observations, like changes in the Parada, total duration, temperature range, and yield, will be noted down and presented in class.

Experiential-Learning 3.4 : Comparison and analysis between the Pharmacodynamics and pharmacokinetics of mercury and mercurial products

The teacher will allot each student different mercurial products/compounds and ask them to explore and compare the pharmacodynamic and pharmacokinetic behaviour of allotted products/compounds using both classical Ayurvedic theory and modern biomedical models like Rasa Panchaka and modern concepts of pharmacodynamics and pharmacokinetics. The students will also explore available published data. They will present their findings and discuss.

Experiential-Learning 3.5 : Analysis of mercury toxicity and ADR incidences

The teacher will ask each student to search and record any case of mercury toxicity among OPD/IPD patients using mercurial products, explore the probable toxicokinetics, and suggest its management using relevant classical antidotes and modern therapeutics.

OR

The teacher will allot each student a case scenario of mercurial toxicity. The student will be asked to explore the toxico-kinetics and suggest its management using relevant classical antidotes and modern therapeutics.

Modular Assessment

Assessment method						Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. 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. Select any two activities for 25 marks each (2 x 25 = 50 Marks): 1. Each student will be advised to approach comparative study of ancient and contemporary perspectives of Parada. 2. Develop a SOP for Parada Ashta Samskara by each student will perform at least one Samskara. 3. Investigate a case of mercury toxicity, ADR and its possible management. Or Any practical in converted form can be taken for assessment. (25 Marks) AND Any experiential learning method in converted form can be taken for 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 4 : Maharasa Dravya, its processing and utility						
Module Learning Objectives (At the end of the module, the students should be able to) 1. Discuss the characterization of the samples of Maharasa Dravyas 2. Perform various pharmaceutical procedures like Shodhana, Marana, etc. 3. Perform the physicochemical analysis with the current scientific updates 4. Discuss the pharmacology and therapeutic application of Maharasa Dravya						

5. Describe the new metal, minerals, procedures, and principles related to Maharasa Dravyas

M 4 Unit 1 Maharasa Dravyas with special reference to Abhraka and Vaikranta
 1.1. Comparative analysis of Maharasa Dravyas mentioned in various texts
 1.2. Characterization of Maharasa dravyas
 1.3. Abhraka
 1.4. Vaikranta

References: 93,94,95,96,97,98,99,101,104,106,109,343,344,345,346,347,348,349

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3	Describe and critically discuss the different Maharasa Dravyas mentioned in the classics	1	Lecture	CC	Knows-how	L,L_VC, L&PPT
CO 1,CO 2,CO 3,CO 4,CO 8	Analyze the technique of characterization for Maharasa Dravyas	1	Lecture	CAN	Knows-how	L&PPT ,DIS,CBL
CO 1,CO 2,CO 7	Describe the significance of Abhraka Pancha Samskara	1	Lecture	CC	Knows-how	L&PPT ,L,L&GD
CO 1,CO 2,CO 3,CO 4,CO 8	Discuss the mineralogical identity of Vaikranta	1	Lecture	CAP	Knows-how	L&PPT , DIS,BL,L_VC
CO 1,CO 2,CO 3,CO 4,CO 8	Analyze and Verify Maharasa Dravya Samples.	2	Practical Training 4.1	PSY-GUD	Shows-how	FV,DL,D, BL,DIS
CO 1,CO 2,CO 7	Perform Shodhana, Marana, and other pharmaceutical procedures related to Abhraka and Vaikranta	5	Practical Training 4.2	PSY-GUD	Shows-how	L_VC,DL ,DIS,D,F V

CO 1,CO 2,CO 7	Analyze the pharmacotherapeutic attributes of Abhraka Bhasma and Vaikranta Bhasma	5	Experiential-Learning 4.1	PSY-MEC	Knows-how	DIS,PER,DA
CO 6,CO 7	Analyse the pharmacology and clinical applications of Abhraka and Vaikranta	2	Experiential-Learning 4.2	PSY-ADT	Knows-how	PER,DIS,BS,CBL,PrBL

M 4 Unit 2 Principles and Processing of Makshika and Vimala2.1 Critical understanding of Makshika (Copper Pyrite)
2.2 Detailed understanding of Vimala (Iron Pyrite)

References: 93,95,98,101,104

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 5,CO 6,CO 7	Describe the therapeutic applications of Makshika and Vimala Bhasma, along with the antidotes for toxicity/ADR caused by them	1	Lecture	CC	Knows-how	L&GD,L &PPT
CO 1,CO 7	Perform Shodhana, Marana, and other pharmaceutical procedures related to Makshika and Vimala	5	Practical Training 4.3	PSY-GUD	Shows-how	DIS,D,DL
CO 4,CO 5,CO 7	Perform the Shodhana of Makshika Bhasma and Vimala Bhasma	5	Experiential-Learning 4.3	PSY-GUD	Shows-how	D,DIS

M 4 Unit 3 Principles and Processing of Shilajit and Sasyaka3.1 Shilajatu (Black Bitumen)
3.2 Sasyaka(Bornite)/Tuttha(Blue Vitriol)

References: 58,59,93,95,97,98,101,104,109,237,357

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 5,CO 6	Describe and analyze the therapeutic applications of Shilajatu and Sasyaka/Tuttha, along with the antidotes for toxicity/ADR caused by them	1	Lecture	CAN	Knows-how	DIS,DA,PER,IBL,L &GD
CO 1,CO 4,CO	Perform Shodhana, Marana, and other pharmaceutical procedures related to Shilajatu	3	Practical	PSY-	Shows-	DIS,D

7	and Sasyaka/Tuttha		Training 4.4	GUD	how	
CO 1,CO 4,CO 7	Perform the Shodhana of Shilajit and Sasyaka/Tuttha	6	Experiential-Learning 4.4	PSY-GUD	Shows-how	PrBL,DIS
M 4 Unit 4 Principles and Processing of Chapala and Kharpara, along with physico-chemical analysis, with research updates of all Maharasa Dravyas Bhasma/ Shodhita products 4.1 Chapala 4.2 Kharpara References: 362,363,364,365,366						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6,CO 7	Describe the therapeutic applications of Chapala and Kharpara Bhasma, along with the antidotes for toxicity/ADR caused by them	1	Lecture	CAP	Knows-how	L&GD,IB L,L&PPT ,DIS
CO 4,CO 5,CO 7	Perform Shodhana, Marana, and other pharmaceutical procedures related to Chapala/Kharpara	2	Practical Training 4.5	PSY-GUD	Shows-how	TUT,D
CO 4,CO 7,CO 8	Demonstrate and perform physico-chemical analysis of Bhasma / Shodhita products of Maharasa Dravya category	3	Practical Training 4.6	PSY-GUD	Shows-how	D,DL
CO 4,CO 5,CO 7,CO 8	Explore and perform the pharmaceutical procedure, like Shodhana, Marana for Chapala/Kharpara, using authentic or substitute drugs	3	Experiential-Learning 4.5	PSY-MEC	Does	PrBL,DIS
M 4 Unit 5 Utility of new metals and minerals 5.1 New metals/ minerals that align with Maharasa Dravyas References: 358,359,360,361						
3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Describe the utility of new metals and minerals that align with Maharasa Dravyas	1	Lecture	CC	Knows-how	L&GD,L, L&PPT

CO 5,CO 7,CO 8	Explore Shodhana process for the new metal/ minerals that align with Maharasa Dravyas	1	Lecture	CE	Knows-how	IBL,PrBL, L&GD,BS, L&PPT
CO 5,CO 7,CO 8	Describe Marana process for the new metal/ minerals that align with Maharasa Dravyas	1	Lecture	CE	Knows-how	BS,CBL, IBL
CO 3,CO 7,CO 8	Identify and analyze New Metallic/Mineral Resources that align with Maharasa Dravyas Principles.	5	Experiential-Learning 4.6	PSY-GUD	Shows-how	PBL,PrBL

Practical Training Activity

Practical Training 4.1 : Analysis and Verification of Maharasa Dravya Samples.

The students will identify and authenticate various samples of Maharasa Dravyas under the teacher's supervision, utilizing classical Grahya Lakshanas and mineralogical identification techniques. The observations made during the authentication process will be presented, recorded, and compiled in a tabular format in class. The teacher will allot each student with different drug from Maharasa. The teacher will instruct each student to search the relevant database regarding the mineralogical characters, physico-chemical properties and crystallography of the given samples. The students will explore, note down the findings, present the same and discuss.

Practical Training 4.2 : Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Abhraka and Vaikranta

The students will perform various procedures, such as Shodhana, Dhanyabhrakikarana, and Marana, related to Abhraka/Vaikranta under the teacher's supervision, following a selected method. Relevant observations and yield will be recorded, presented, and discussed in class. The discussion will include the topics like, basis of each type of shodhana/marana or each bhavana Dravya etc

Practical Training 4.3 : Practical Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Makshika and Vimala

The students will perform various procedures, such as Shodhana and Marana, related to Makshika and Vimala, using a selected method. Relevant observations and yield will be recorded, presented, and discussed in class.

Practical Training 4.4 : Practical Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Shilajatu and Sasyaka/Tuttha

The students will perform various procedures, such as Shodhana and Marana, related to Shilajatu and Sasyaka/Tuttha, using a selected method. Relevant observations and yield will be recorded, presented, and discussed in class.

Practical Training 4.5 : Practical Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Chapala/Kharpara
The students will perform various procedures, such as Shodhana and Marana, related to Chapala/Kharpara, using a selected method. Relevant observations and yield will be recorded, presented, and discussed in class.
Practical Training 4.6 : Physico-Chemical Characterization of Bhasma/Shodhita Products in Maharasa Dravya category.
The teacher will demonstrate the physico-chemical analysis of one Bhasma and one Shodhita product from the Maharasa Dravya category. Students will record the observations and present them in class.
Experiential learning Activity
Experiential-Learning 4.1 : Pharmacotherapeutic attributes of Abhraka Bhasma and Vaikranta Bhasma
The teacher will assign each student a specific topic related to the pharmacological, toxicokinetic, and clinical attributes and applications of Abhraka and Vaikranta. Students will search and gather information from classical texts, published scientific literature, and case studies. They will then present their findings and engage in a class discussion
Experiential-Learning 4.2 : Critical Analysis of Abhraka and Vaikranta: Pharmacology and Clinical Applications
The teacher will assign each student a specific topic related to the pharmacological, toxicokinetic, and clinical attributes and applications of Abhraka and Vaikranta. Students will search and gather information from classical texts, published scientific literature, and case studies. They will then present their findings and engage in a class discussion
Experiential-Learning 4.3 : Explore and perform the Makshika Bhasma and Vimala Bhasma
Each student will prepare Makshika/Vimala Bhasma using at least one method. The student will record their observations and findings, and then present their results in class. The teacher will provide feedback and recent updates on the subject
Experiential-Learning 4.4 : Exploration and performance of Shodhana and other pharmaceutical procedures of Shilajit and Sasyaka/Tuttha
Each student will perform at least one method of Shodhana/Marana for Shilajit and Sasyaka/Tuttha. The student will record their observations and findings, and then present their results in class. The teacher will provide feedback and recent updates on the subject.
Experiential-Learning 4.5 : Explore and perform the pharmaceutical procedure, like Shodhana, Marana for Chapala/Kharpara, using authentic or substitute drugs.
Each student will perform at least one pharmaceutical procedure, such as Shodhana or Marana, for Chapala/Kharpara, using authentic or substitute drugs. The student will note down and record their observations and findings, and then present their results in class. The teacher will provide feedback and recent updates on the subject.

Experiential-Learning 4.6 : Exploring New Metallic/Mineral Resources that align with Maharasa Dravyas Principles.

Each student will explore and identify a novel metal or mineral inspired by traditional Maharasa Dravyas, integrating classical Rasa Shastra principles with modern scientific inquiry, utilizing resources such as metal and mineral databases. Students will propose a new metal or mineral in class, accompanied by a supporting hypothesis.

OR
As per availability, they will visit and have access to different labs like metallurgy or material science

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

Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

1. LAQ/ABQ on Comparative study of Rasa Dravyas as per different classics
2. Class presentation on Characterization of Maharasa Dravyas
3. Preparation of Checklist
4. Interaction regarding new minerals that align with Maharasa Dravyas

OR
Any practical in converted form can be taken for assessment. (25 Marks)
and
Any experiential learning method in converted form can be taken for 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/ Experientia l Learning	3E Domain/ Sub Domain	3F Level (D oes/Sho ws how/ Knows h ow/Kno	3G Teachin g Learnin g Methods
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Module 5 : Critical appraisal of Uparasa Dravya and Sadharana Rasa Dravya**Module Learning Objectives****(At the end of the module, the students should be able to)**

1. Describe Uparasa and Sadharana Rasa Dravyas with their classical references.
- 2 . Perform Shodhana, Marana, and other pharmaceutical processes specific to Uparasa and Sadharana Rasa Dravyas.
- 3 . Analyze physico-chemical characteristics of processed drugs with scientific and classical perspectives.
- 4 Describe the toxicological and therapeutic properties of Uparasa and Sadharana Rasa Dravyas.

M 5 Unit 1 Principle and Processing of Uparasa Dravya1.1 Uparasa Dravyas mentioned in various texts

1.2 Characterization of Uparasa Dravyas

1.3 Pharmaceutical processes of Uparasa Dravya

1.4 Pharmacology and clinical application of Uparasa Dravya

References: 59,93,94,95,96,97,98,99,100,101,102,104,106,108,109

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3	Describe the different Uparasa Dravyas mentioned in the classics	1	Lecture	CC	Knows-how	L&GD
CO 1,CO 2,CO 3	Discuss the controversial drugs under Uparasa category	1	Lecture	CC	Knows-how	PER,PBL, DIS,L&P PT
CO 1,CO 2,CO 3	Discuss the mineralogical characterization of Uparasa	1	Lecture	CC	Knows-how	DA,L&P PT ,BS,DIS,L_VC

CO 1,CO 2,CO 3,CO 5,CO 6	Recognise the therapeutic applications and toxico-kinetics of Uparasa Dravyas	1	Lecture	CAP	Knows-how	JC,L&PP T ,BS,DIS
CO 5,CO 8	Discuss research updates on Uparasa drugs	1	Lecture	CC	Knows-how	BS,L&PP T ,DA,DIS,BL
CO 1,CO 2,CO 3	Demonstrate the authentication of Uparasa Dravyas	2	Practical Training 5.1	PSY-GUD	Shows-how	DL,D,DA
CO 1,CO 2,CO 3	Demonstrate Shodhana, Marana and other pharmaceutical procedures for Uparasa	4	Practical Training 5.2	PSY-GUD	Shows-how	D
CO 3,CO 4,CO 8	Demonstrate Quality Control testing for the products of Uparasa Dravya	4	Practical Training 5.3	PSY-GUD	Shows-how	DL
CO 2,CO 3,CO 4	Identify and authenticate Uparasa Dravyas	3	Experiential-Learning 5.1	PSY-ADT	Shows-how	DA,LS,JC ,LRI,BS
CO 3,CO 4,CO 8	Perform Quality Control tests for the products of Uparasa Dravya	3	Experiential-Learning 5.2	PSY-GUD	Shows-how	DL
CO 1,CO 2,CO 7	Prepare formulations of Uparasa Dravya	5	Experiential-Learning 5.3	PSY-GUD	Shows-how	TPW,PrBL
CO 5,CO 7,CO 8	Review articles on the toxicity and ADRs of Haratala and Manahshila and interpret.	2	Experiential-Learning 5.4	PSY-MEC	Shows-how	PrBL,DIS ,PER,JC, CBL

M 5 Unit 2 Principle and Processing of Sadharana Rasa2.1 Sadharana rasa Dravyas mentioned in various texts

2.2 Characterization of Sadharana Rasa Dravyas

2.3 Pharmaceutical processes of Sadharana rasa Dravya

2.4 Pharmacology and clinical application of Sadharana rasa Dravya

References: 93,94,95,96,97,98,99,101,102,103,104,105,106,108,109,110,112,113

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Describe and critically discuss the different Sadharana Rasa Dravyas mentioned in the classics	1	Lecture	CC	Knows-how	DIS,L&G D,BS
CO 1,CO 2	Analyze the controversial drugs under Sadharana Rasa category	1	Lecture	CAP	Knows-how	DIS,L&P PT ,L_VC ,BS,IBL
CO 1,CO 3,CO 4	Discuss the mineralogical characterization of Sadharana Rasa	1	Lecture	CAP	Knows-how	BL,L&PP T ,DIS,CBL
CO 7,CO 8	Recognise the therapeutic applications and toxico-kinetics of Sadharana Rasa Dravyas	1	Lecture	CC	Knows-how	DIS,BL,L &PPT
CO 5,CO 8	Discuss research updates on Sadharana Rasa drugs	1	Lecture	CE	Knows-how	BS,CBL,J C
CO 3,CO 4	Demonstrate authentication of Sadharana Rasa Dravya	2	Practical Training 5.4	PSY-GUD	Shows-how	DL,D
CO 4,CO 7,CO 8	Demonstrate Shodhana, Marana and other pharmaceutical procedures for Sadharana Rasa	4	Practical Training 5.5	PSY-GUD	Shows-how	DL
CO 1,CO 2	Demonstrate Quality Control testing for the products of Sadharana Rasa Dravya	4	Practical Training 5.6	PSY-GUD	Shows-how	DA,DL,D IS,D
CO 2,CO 3,CO 4	Identify and authenticate Sadharana Rasa Dravyas	3	Experiential-Learning 5.5	PSY-GUD	Shows-how	DIS,FV,P rBL
CO 3,CO 4,CO 8	Perform Quality Control tests for the products of Sadharana Rasa Dravya	3	Experiential-Learning 5.6	PSY-ADT	Shows-how	DIS,DA

CO 1,CO 2,CO 7	Prepare and present the formulations of Sadharana Rasa Dravya	3	Experiential-Learning 5.7	PSY-ADT	Does	PrBL,DIS
CO 5,CO 8	Assemble the utility of Sadharana Dravyas in the clinical practice through a Field Survey of manufacturers and clinicians.	4	Experiential-Learning 5.8	PSY-GUD	Does	FV,PrBL,PER,DIS

Practical Training Activity

Practical Training 5.1 : Authentication of Uparasa Dravyas

The teacher will select a drug from Uparasa category and will demonstrate the identification and authentication of the selected drug using classical Grahya Lakshana and mineralogical references with cross-verification through reference samples

Practical Training 5.2 : Demonstration of Shodhana, Marana and other pharmaceutical procedures for Uparasa

The students will perform various procedures such as Shodhana, Marana, Pishti Nirmana etc related to Uparasa Dravyas under teacher's direct supervision, following a selected method. Relevant observations and yield will be recorded, presented, and discussed in class.

The students may be allotted a selected Shodhana/Marana procedure of Uparasa Dravya mentioned in UG syllabus. The students will demonstrate the practical to UG students and discuss

Practical Training 5.3 : Demonstration of Quality Control testing for the products of Uparasa Dravya

The teacher will select a processed drug from Uparasa category, such as a Shodhita Dravya, Bhasma or Pishti and will demonstrate the quality testing procedure using organoleptic, physico-chemical parameters and instrumental methods. The students will observe the procedures, record the findings, present the same and discuss

Practical Training 5.4 : Identification and authentication of Sadharana Rasa Dravyas

The teacher will select a drug from Sadharana Rasa category and will demonstrate the identification and authentication of the selected drug using classical Grahya Lakshana, mineralogical characters and physico-chemical properties. The sample will be cross-verified with the reference samples.

Practical Training 5.5 : Demonstration of Shodhana, Marana and other pharmaceutical procedures for Sadharana Rasa

The students will perform various procedures such as Shodhana, Marana, Satva Patana etc related to Sadharana Rasa Dravyas under teacher's direct supervision, following a selected method. Relevant observations and yield will be recorded, presented, and discussed in class.

The students may be allotted a selected Shodhana/Marana procedure of Sadharana Rasa Dravya mentioned in UG syllabus. The students will demonstrate the practical to UG students and discuss

Practical Training 5.6 : Demonstration of Quality Control testing for the products of Sadharana Rasa Dravya

The teacher will select a processed drug from Sadharana Rasa category, such as a Shodhita Dravya, Bhasma and will demonstrate the quality testing procedure using organoleptic, physico-chemical parameters and instrumental methods. The students will observe the procedures, record the findings, present the same and discuss

Experiential learning Activity

Experiential-Learning 5.1 : Identify and perform an authentication process of Uparasa Dravyas

The teacher will allot each student with a different drug from Uparasa category. The students will identify and authenticate the given drug based on classical Grahya Lakshana and mineralogical references with cross-verification through reference samples, The students will present their findings and discuss

The teacher will allot each student with different drug from Uparasa category. The teacher will instruct each student to search the relevant database regarding the mineralogical characters, physico-chemical properties and crystallography(whenever applicable) of the given samples. The students will explore, note down the findings, present the same and discuss.

Experiential-Learning 5.2 : Performing Quality Control tests for the products of Uparasa Dravya

The teacher will allot each student with different processed drug from Uparasa category, such as a Shodhita Dravya, Bhasma or Pishti. The students will test the given sample following organoleptic, physico-chemical parameters and instrumental methods. The students will record the findings, present the same and discuss

Experiential-Learning 5.3 : Preparation and presentation of formulations of Uparasa Dravya

The teacher will allot each student with a different formulation of Uparasa Dravyas such as, Gandhaka Rasayana, Kasisa Bhasma etc. The students will explore the reference, Standard Manufacturing Process and will prepare the given formulation accordingly. The students will present their findings in the class and discuss the steps, challenges, and outcomes

Experiential-Learning 5.4 : Critical Review of toxicity and ADRs of Haratala and Manahshila

The teacher will instruct each student to explore real or hypothetical case reports involving ADRs or Toxicity of the products containing Haratala and Manahshila. The students will carry out literature review from classics and modern toxicology texts, critically discuss the findings and suggest preventive and remedial measures

Experiential-Learning 5.5 : Identify and authenticate Sadharana Rasa Dravyas

The teacher will allot each student with a different drug from Sadharana rasa category. The students will identify and authenticate the given drug based on classical Grahya Lakshana and mineralogical references with cross-verification through reference samples, The students will present their findings and discuss The teacher will allot each student with different drug from Sadharana Rasa. The teacher will instruct each student to search the relevant database regarding the mineralogical characters, physico-chemical properties and crystallography(whenever applicable) of the given samples. The students will explore, note down the findings, present the same and discuss.	
Experiential-Learning 5.6 : Performing Quality Control tests for the products of Sadharana Rasa Dravya	
The teacher will allot each student with different processed drug from Sadharana Rasa category, such as a Shodhita Dravya, Bhasma or Pishti. The students will test the given sample following organoleptic, physico-chemical parameters and instrumental methods. The students will record the findings, present the same and discuss	
Experiential-Learning 5.7 : Preparation and presentation of formulations of Sadharana Rasa Dravya	
The teacher will allot each student with a different formulation of Sadharana Rasa Dravyas. The students will explore the reference, Standard Manufacturing Process and will prepare the given formulation accordingly. The students will present their findings in the class and discuss the steps, challenges, and outcomes	
Experiential-Learning 5.8 : Field Survey: Manufacturer/clinicians using Sadharana Dravyas	
The teacher will instruct each student to explore the Sadharana Rasa Dravya used by manufacturers/clinicians/traditional healers. The students will interact, and collect the information regarding Sadharana Rasa Dravyas. They will compile the data and present	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. 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 points Select any two activities for 25 marks each (2 x 25 = 50 Marks): 1.Making charts on Upaarasa/Sadharana Rasa Dravyas as per different classics 2.Class presentation on Characterization of Uparasa/Sadharana Rasa Dravyas 3.Preparation of Check list 4.Structured LAQ OR Any practical in converted form can be taken for assessment. (25 Marks) and	4

Any experiential learning method in converted form can be taken for 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
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Module 6 : Critical appraisal of Dhatu and Updhatu

Module Learning Objectives

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

1. Describe classical references, properties, and classifications of Dhatu and Upadhatu.
2. Perform Shodhana, Marana, and other pharmaceutical procedures specific to Dhatu and Upadhatu Dravyas.
3. Analyze physico-chemical characteristics of processed Dhatu and Upadhatu with scientific and classical correlation.
4. Evaluate toxicological and therapeutic properties of commonly used Dhatu and Upadhatu formulations.

M 6 Unit 1 Principle and Processing of Dhatu / Metals1.1 Dhatus mentioned in Rasa classics

- 1.2 Classification and characterization of metals
- 1.3 Pharmaceutical processing (Shodhana, Marana, etc.)
- 1.4 Therapeutic uses, toxicity, and safety of metallic preparations

References: 93,94,95,96,97,98,99,101,103,104,105,106,108,109

3A	3B	3C	3D	3E	3F	3G
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CO 1,CO 2	Describe classical Dhatu Dravyas	1	Lecture	CC	Knows-how	L_VC,L, L&PPT
CO 1,CO 2,CO 3	Discuss the controversial metals in Ayurveda texts	1	Lecture	CC	Knows-how	L&GD,L &PPT
CO 3,CO 4	Characterize Dhatu Dravyas mineralogically and pharmaceutically	1	Lecture	CAN	Knows-how	LS,DIS,J C
CO 6,CO 8	Identify therapeutic applications and toxico-kinetics of Dhatu	1	Lecture	CAP	Knows-how	IBL,DSN, L&GD
CO 5,CO 8	Compile and interpret research and regulatory updates on metal-based Ayurvedic drugs	1	Lecture	CAN	Knows-how	L&PPT , L&GD,L S,DIS,JC
CO 3,CO 4	Demonstrate the authentication of Dhatu Dravya	2	Practical Training 6.1	PSY-GUD	Shows-how	D,DL,DIS
CO 1,CO 2,CO 5	Perform pharmaceutical processing (Shodhana & Marana) of metals	4	Practical Training 6.2	PSY-GUD	Shows-how	D
CO 4,CO 5,CO 8	Demonstrate Quality control of metallic preparations	4	Practical Training 6.3	PSY-GUD	Shows-how	D,DL
CO 3,CO 8	Identify and document classical Dhatus	3	Experiential-Learning 6.1	PSY-MEC	Does	CBL,PrB L
CO 4,CO 5,CO 8	Perform Quality assessment of Dhatu Bhasma	3	Experiential-Learning 6.2	PSY-GUD	Shows-how	DIS,PrBL
CO 1,CO 2,CO 7	Prepare formulations using Dhatu Bhasma	5	Experiential-Learning 6.3	PSY-GUD	Does	PrBL,TP W,CBL,D IS
CO 7,CO 8	Identify and analyze Adverse drug reactions (ADRs) due to metals	2	Experiential-	PSY-	Shows-	RLE,CBL

			Learning 6.4	GUD	how	,RP,BS,Pr BL
M 6 Unit 2 Principle and Processing of Upadhatu 2.1 Classical analysis of Upadhatu 2.2 Classification, sources, and characteristics of Upadhatu 2.3 Pharmaceutical processing (Shodhana, Marana, etc.) of Upadhatu 2.4 Pharmacological actions and clinical application of Upadhatu References: 93,94,95,96,97,98,101,103,104,105,106,107,108,109						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Describe and classify Upadhatu from Rasashastra references	1	Lecture	CC	Knows-how	BS,FV,DI S,L&PPT ,LS
CO 3,CO 4,CO 8	Discuss controversial and newly interpreted Upadhatu	1	Lecture	CAP	Knows-how	TPW,PB L,BS,DIS ,L&GD
CO 3,CO 8	Analyze Upadhatu mineralogically and pharmaceutically	1	Lecture	CAN	Knows-how	BS,CBL, DIS,BL,L &PPT
CO 6,CO 7	Recognize therapeutic applications and possible ADRs of Upadhatu	1	Lecture	CE	Knows-how	L&GD,IB L,PL,CB L,BS
CO 5,CO 8	Review and interpret findings of research and current practices involving Upadhatu	1	Lecture	CAN	Knows-how	JC,DIS
CO 3,CO 4	Demonstrate the Identification of Upadhatu samples	2	Practical Training 6.4	PSY- GUD	Shows-how	DIS,DL,D
CO 1,CO 2	Demonstrate Shodhana and Marana of Upadhatu	4	Practical	PSY-	Shows-	D

			Training 6.5	GUD	how	
CO 4,CO 5,CO 8	Demonstrate the Quality control tests for sub-metallic formulations	4	Practical Training 6.6	PSY-GUD	Shows-how	DL
CO 3,CO 4,CO 8	Identify the Upadhatu samples	3	Experiential-Learning 6.5	PSY-GUD	Shows-how	DIS,PrBL,SDL
CO 4,CO 5,CO 8	Perform Quality Control tests for the products of Upadhatu	3	Experiential-Learning 6.6	PSY-GUD	Shows-how	PrBL,CD
CO 1,CO 2,CO 7	Prepare Upadhatu formulations	3	Experiential-Learning 6.7	PSY-ADT	Does	DIS,PrBL
CO 5,CO 8	Analyze and interpret findings of the utility of Dhatu and Upadhatu in clinical practice through a Field survey with Manufacturers or Vaidyas	4	Experiential-Learning 6.8	PSY-GUD	Shows-how	DIS,PER,TPW,FV

Practical Training Activity

Practical Training 6.1 : Demonstration of authentication of Dhatu Dravya

The teacher will select a Dhatu (metal) and demonstrate the identification and authentication of the selected Dhatu/metal using both classical and modern identification techniques using Grahya Lakshana and mineralogical methods. The students will note the observations and discuss

Practical Training 6.2 : Pharmaceutical processing (Shodhana & Marana) of metals

The teacher will select a Dhatu(metal) and explain the pharmaceutical process for that metal like, Shodhana and Marana. The students will perform these pharmaceutical procedures under the guidance of the teacher.

Later, the students will demonstrate the relevant pharmaceutical process of a metal to the UG students as per the NCISM syllabus, describe and discuss under the direct supervision of the teacher

Practical Training 6.3 : Quality control of metallic preparations

The teacher will select a processed drug from Dhatu category, such as a Shodhita Dravya or Bhasma and will demonstrate the quality testing procedure using organoleptic, physico-chemical parameters and instrumental methods. The students will observe the procedures, record the findings, present the same and discuss

Practical Training 6.4 : Identification of Upadhatu samples

The teacher will select a drug from Upadhatu category and will demonstrate the identification and authentication of the selected drug using classical Grahya Lakshana and mineralogical references with cross-verification through reference samples

Practical Training 6.5 : Shodhana and Marana of Upadhatu

The students will perform various procedures such as Shodhana and Marana related to Upadhatu Dravyas under teacher's direct supervision, following a selected method. Relevant observations and yield will be recorded, presented, and discussed in class.

The students may be allotted a selected Shodhana/Marana procedure of Upadhatu Dravya mentioned in UG syllabus. The students will demonstrate the practical to UG students and discuss

Practical Training 6.6 : Demonstrate the Quality control of sub-metallic formulations

The teacher will select a processed drug from Upadhatu category, such as a Shodhita Dravya, Bhasma or a formulation containing Upadhatu Bhasma and will demonstrate the quality testing procedure using organoleptic, physico-chemical parameters and instrumental methods. The students will observe the procedures, record the findings, present the same and discuss

Experiential learning Activity**Experiential-Learning 6.1 : Identification & documentation of classical Dhatus**

The teacher will allot each student with a different drug from Dhatu category. The students will identify and authenticate the given drug based on classical Grahya Lakshana and mineralogical references with cross-verification through reference samples, The students will present their findings and discuss

Experiential-Learning 6.2 : Quality assessment of Dhatu Bhasma

The teacher will allot each student with different Dhatu Bhasma (Loha Bhasma, tamra Bhasma etc). The students will test the given sample following classical Bhasma pareeksha, organoleptic, physico-chemical parameters and instrumental methods. The students will record the findings, present the same and discuss

Experiential-Learning 6.3 : Formulation preparation using Dhatu Bhasma

The teacher will allot each student with a different formulation containing Dhatu Bhasma(e.g.Navayasa Louha). The students will explore the reference, Standard Manufacturing Process and will prepare the given formulation accordingly. The students will present their findings in the class and discuss the steps, challenges, and outcomes

Experiential-Learning 6.4 : Critical appraisal of ADRs due to metals	
The teacher will instruct each student to explore real or hypothetical case reports involving ADRs or Toxicity of the products containing metals. The students will carry out literature review from classics and modern toxicology texts, critically discuss the findings and suggest preventive and remedial measures	
Experiential-Learning 6.5 : Identification of Upadhatu samples	
The teacher will allot each student with a different drug from Upadhatu category. The students will identify and authenticate the given drug based on classical Grahya Lakshana and mineralogical references with cross-verification through reference samples, The students will present their findings and discuss	
Experiential-Learning 6.6 : Performing Quality Control tests for the products of Upadhatu	
The teacher will allot each student with different processed drug from Upadhatu category, such as a Shodhita Dravya or Bhasma. The students will test the given sample following organoleptic, physico-chemical parameters and instrumental methods. The students will record the findings, present the same and discuss	
Experiential-Learning 6.7 : Preparation of Upadhatu formulations	
The teacher will allot each student with a different formulation of Upadhatu Dravyas. The students will explore the reference, Standard Manufacturing Process and will prepare the given formulation accordingly. The students will present their findings in the class and discuss the steps, challenges, and outcomes	
Experiential-Learning 6.8 : Field survey: Manufacturers or Vaidyas using Dhatu/Upadhatu	
The teacher will instruct each student to explore the formulations of Dhatu/Upadhatu used by manufacturers/clinicians. The students will interact, and collect the information regarding Dhatu/Upadhatu Dravyas. They will carry out the Case documentation on sourcing, processing, and therapeutic applications	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points Select any two activities for 25 marks each (2 x 25 = 50 Marks): 1. Critical writing on mineralogical and pharmaceutical aspects of Upadhatu 2. Case-based analysis on controversial and newly interpreted Upadhatu 3. Structured LAQ	4

4. Viva Voce OR Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential learning method in converted form can be taken for assessment (25 marks)	
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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
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Module 7 : Sudha Varga, Sikata Varga, Visha Varga Dravyas

Module Learning Objectives

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

1. Identify and classify the drugs of Sudha Varga, Sikata Varga, and Visha Varga.
2. Perform pharmaceutical processes, including Shodhana and Marana, for Sudha Varga and Sikata Varga drugs, and Shodhana for Visha Varga drugs.
3. Describe the physico-chemical properties of Sudha Varga, Sikata Varga, and Visha Varga drugs.
4. Discuss the pharmacology and therapeutic applications of Sudha Varga, Sikata Varga, and Visha Varga drugs.

M 7 Unit 1 Characterization, Pharmaceutical Processing, and Clinical Applications of Sudha Varga Dravya 1.1 Classification and Identification of Sudha Varga Dravyas
1.2 Pharmaceutical Processing of Sudha Varga Dravya

1.3 Quality Control Methods for Sudha Varga Dravya

1.4 Pharmacology, Therapeutic Applications, and Research Updates on Sudha Varga Dravya

References: 104,106,107,109,389,390,391

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3,CO 4	Discuss the list of Sudha varga Dravya mentioned in various classics and their mineralogical correlation	1	Lecture	CC	Knows-how	L_VC,L,L&GD,L &PPT
CO 1,CO 2,CO 7,CO 8	Discuss the pharmacological and therapeutic applications of Sudha Varga Dravya	2	Lecture	CAP	Knows-how	L&PPT ,L_VC,L
CO 3,CO 4,CO 5	Discuss research updates on characterization, pharmaceutical processing, QC, and pharmacotherapeutics of Sudhavarga Dravya	2	Lecture	CAP	Knows-how	CBL,L&PPT ,L_VC ,DIS
CO 1,CO 2,CO 7	Demonstrate Shodhana, marana, and Pishti Nirmana of Sudha varga Dravya	6	Practical Training 7.1	PSY-GUD	Shows-how	DIS,D
CO 4,CO 8	Demonstrate the quality testing procedures for Bhasma/Pishti of Sudha vargeeya Dravya	4	Practical Training 7.2	PSY-GUD	Shows-how	D,DIS
CO 3,CO 4	Perform Shodhana, marana, and Pishti Nirmana of Sudha varga Dravya	7	Experiential-Learning 7.1	PSY-GUD	Shows-how	DL,D,PrBL
CO 3,CO 4	Perform quality testing procedures for Bhasma/Pishti of Sudha Vargeeya Dravya	6	Experiential-Learning 7.2	PSY-GUD	Shows-how	D,DA,DL ,LRI

M 7 Unit 2 Characterization, pharmaceutical processing, and clinical applications of Sikata Varga Dravya2.1 Identification of Sikata Varga dravyas according to various classics, identified based on mineralogical characters

2.2 Shodhana, marana, and other pharmaceutical processes of Sikata varga Dravya as per the SOP laid down

2.3 Quality control methods for the drugs of Sikata Varga Dravya

2.4 Pharmacology, therapeutic application, and research updates on Sikata Varga Dravya)

References: 104,106,107,109,392,393,394

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 3	Discuss the list of Sikata varga Dravya mentioned in various classics and their mineralogical correlation	1	Lecture	CC	Knows-how	DIS,L&P PT ,LS,BL
CO 1,CO 2,CO 6,CO 7,CO 8	Describe the pharmacology and therapeutic applications of Sikata Varga Dravya	2	Lecture	CAP	Knows-how	DIS,BS,LS,JC,TP W
CO 3,CO 4	Discuss research updates on characterization, pharmaceutical processing, QC, and pharmacotherapeutics of Sikata Varga Dravya	2	Lecture	CC	Knows-how	L_VC,L&PPT ,BS, BL,DIS
CO 3,CO 4	Demonstrate Shodhana, marana, and Pishti Nirmana of Sikata varga Dravya	6	Practical Training 7.3	PSY-GUD	Shows-how	DL,IBL,DIS,BS,D
CO 4,CO 8	Demonstrate quality testing procedures for Bhasma/Pishti of Sikata vargeeya Dravya	4	Practical Training 7.4	PSY-GUD	Shows-how	DL,DA,D
CO 1,CO 7	Perform Shodhana, marana and Pishti Nirmana of Sikata varga Dravya	7	Experiential-Learning 7.3	PSY-GUD	Shows-how	D,CBL,DIS,PrBL, DL
CO 4,CO 8	Perform quality testing procedures for Bhasma/Pishti of Sikata vargeeya Dravya	6	Experiential-Learning 7.4	PSY-GUD	Shows-how	PSN,DIS, PrBL

M 7 Unit 3 Pharmaceutical processing, phytopharmacology and clinical applications of Visha Varga dravya

3.1 Drugs of Visha and Upavisha categories from different classics

3.2 Shodhana of Visha-Upavisha Dravya based on different references

3.3. Phytochemical changes after the process of Shodhana

3.4. Clinical application and therapeutics of Visha Varga

References: 104,106,107,109,315,395,396,397,398,409,410,411,412,413,414,415,416,417

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Discuss and compare the drugs of the Visha and Upavisha categories from different classics	1	Lecture	CC	Knows-how	C_L,L&P PT ,BS
CO 3,CO 4	Describe the identification of herbal, animal, and mineral drugs mentioned under the Visha-Upavisha category based on organoleptic and physico-chemical characters	1	Lecture	CC	Knows-how	PER,L&P PT ,TPW
CO 5,CO 6,CO 8	Discuss the phytopharmacology of herbal drugs mentioned under the Visha-Upavisha category	2	Lecture	CC	Knows-how	DIS,BL,L &PPT
CO 1,CO 2,CO 6	Describe formulations and therapeutic applications of Visha Dravya	1	Lecture	CAP	Knows-how	L&PPT ,LS,DIS
CO 1,CO 2,CO 7	Demonstrate the Shodhana Process of Visha Dravya	6	Practical Training 7.5	PSY-GUD	Shows-how	DIS,D,DL
CO 3,CO 4	Demonstrate the analytical testing process for Shodhita Visha dravya	4	Practical Training 7.6	PSY-GUD	Shows-how	LRI,DL,D IS,D
CO 1,CO 2,CO 7	Perform Shodhana of Visha Dravyas as per different classics	7	Experiential-Learning 7.5	PSY-GUD	Does	PrBL
CO 4,CO 5,CO 8	Perform analytical testing process for Shodhita Visha dravya	6	Experiential-Learning 7.6	PSY-GUD	Does	DIS,DA

Practical Training Activity

Practical Training 7.1 : Demonstration of Shodhana, marana, and Pishti Nirmana of Sudha varga Dravya

The teacher will select a drug from Sudha Varga and explain the Standard Operating Procedure (SOP) for Shodhana, Marana, and Pishti Nirmana based on a selected classical reference. Under direct supervision, students will then carry out Shodhana, Marana, and Pishtikarana of the selected drug, following the SOP. Students will record

their observations and engage in a discussion.

Practical Training 7.2 : Demonstration of the quality testing procedures for Bhasma/Pishti of Sudha vargeeya Dravya

The teacher will select a sample of Bhasma/Pishti from Sudha Varga Dravya and demonstrate quality testing methods for the product, covering organoleptic, physicochemical parameters, and NPS tests. Students will observe the demonstration and record their observations.

Practical Training 7.3 : Demonstration of Shodhana, marana and Pishti Nirmana of Sikata varga Dravya

The teacher will select a drug from Sikata Varga category and explain the Standard Operating Procedure (SOP) for Shodhana, Marana, and Pishti Nirmana based on a selected classical reference. Under direct supervision, students will then carry out Shodhana, Marana, and Pishtikarana of the selected drug, following the SOP. Students will record their observations and engage in a discussion.

Practical Training 7.4 : Demonstration of the quality testing procedures for Bhasma/Pishti of Sikata vargeeya Dravya

The teacher will select a sample of Bhasma/Pishti from Sikata Varga Dravya and demonstrate quality testing methods for the product, covering organoleptic, physicochemical parameters, and NPS tests. Students will observe the demonstration and record their observations.

Practical Training 7.5 : Demonstration of Shodhana Process of Visha Dravya

The teacher will select a Visha Dravya and demonstrate one of its Shodhana processes, explaining the Standard Operating Procedure (SOP) involved. Students will then perform the Shodhana process under the teacher's direct supervision, adhering to the SOP.

Practical Training 7.6 : Demonstration of the analytical testing process for Shodhita Visha dravya

The teacher will select a Visha Dravya and demonstrate the testing of the sample before and after Shodhana, using parameters such as organoleptic characters, physico-chemical parameters, qualitative phytochemical tests, and Thin Layer Chromatography (TLC).

Experiential learning Activity

Experiential-Learning 7.1 : Shodhana, marana, and Pishti Nirmana of Sudha varga Dravya

The teacher will assign a different Sudha Varga drug to each student and instruct them to carry out Shodhana, Marana, and Pishtikarana of the allotted drug. Students will conduct the practical following the Standard Operating Procedure (SOP), record their observations, present their findings, and engage in a discussion.

Experiential-Learning 7.2 : Quality testing procedures for Bhasma/Pishti of Sudha Vargeeya Dravya

The teacher will assign each student a unique sample of Bhasma/Pishti from Sudha Varga Dravya. Students will conduct quality testing of the assigned product, evaluating organoleptic, physicochemical parameters, and NPS tests. They will observe, record, and present their findings, followed by a class discussion.	
Experiential-Learning 7.3 : Shodhana, marana and Pishti Nirmana of Sikata varga Dravya	
The teacher will assign a different drug from Sikata Varga category to each student. Students will then carry out Shodhana, Marana, and Pishtikarana of their allotted drug, following the Standard Operating Procedure (SOP). They will record their observations, present their findings, and engage in a class discussion	
Experiential-Learning 7.4 : Quality testing procedures for Bhasma/Pishti of Sikata vargeeya Dravya	
The teacher will assign each student a unique sample of Bhasma/Pishti from Sikata Varga Dravya. Students will then conduct quality testing of their assigned product, evaluating organoleptic, physicochemical parameters, and NPS tests. They will observe, record, and present their findings, followed by a class discussion.	
Experiential-Learning 7.5 : Performing Shodhana of Visha Dravyas as per different classics	
The teacher will assign a different Visha Dravya to each student. Students will then carry out Shodhana of their assigned drug, following the Standard Operating Procedure (SOP). They will present their observations and engage in a class discussion. Alternatively, the teacher may assign the same drug to all students and instruct them to perform Shodhana using different classical methods.	
Experiential-Learning 7.6 : Performing analytical testing process for Shodhita Visha dravya	
The teacher will assign each student a different Visha Dravya, providing both unprocessed (Ashuddha) and processed (Shodhita) samples. Students will then conduct comparative testing of the given samples, evaluating parameters such as organoleptic characters, physico-chemical properties, qualitative phytochemical tests, and Thin Layer Chromatography (TLC).	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 75 marks for this module. 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 points Select any three activities for 25 marks each (3 x 25 = 75 Marks): 1. Compilation work 2 . Structured LAQ 3. Chart making on mineralogical characters of Sudha Varga, Sikata Varga drugs	6

4. Class presentation on Shodhana and clinical applications of Visha Dravya

5. Viva Voce

AND

Any two practicals in converted form can be taken for assessment. (2X25 = 50 Marks)

and

Any experiential learning method in converted form can be taken for 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
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Module 8 : Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana

Module Learning Objectives

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

1. Identify and explore precious and semiprecious stones classified under Ratna and Uparatna Varga.
2. Prepare Pishti Kalpa adhering to Standard Operating Procedures (SOPs).
3. Prepare and pharmaceutically modify Gandhaka Druti and Gandhaka Taila Kalpas.
4. Analyze the pharmacology and therapeutic applications of selected Pishti, Gandhaka Druti, and Gandhaka Taila Kalpas.

M 8 Unit 1 Mineralogy, Crystal chemistry, and Pharmacotherapeutics of Ratna-Uparatna Varga

- 1.1 Precious stones.
- 1.2 Uparatna and semiprecious stones
- 1.3 Crystal chemistry and mineralogical properties of Ratna-Uparatna
- 1.4 Pharmacology and therapeutic applications of Ratna and Uparatnas

References: 93,95,96,106,109,112,113,115,374,375,376,377,378,379,380,381

3A	3B	3C	3D	3E	3F	3G
CO 2,CO 3,CO 4	Discuss the characteristics of precious stones with special reference to the mineralogical identification of Ratnas	1	Lecture	CC	Knows-how	L_VC,DIS,L&PPT,L
CO 1,CO 2,CO 3	Describe different semiprecious stones mentioned in Rasashastra texts under the category of Uparatna	1	Lecture	CC	Knows-how	DIS,L&PPT,L
CO 6,CO 7,CO 8	Discuss crystal chemistry, pharmacology and therapeutic applications of Ratna and Uparatnas	1	Lecture	CC	Knows-how	PER,SDL,L&PPT,DIS
CO 3,CO 4	Demonstrate mineralogical identification of precious and semiprecious stones under Ratna and Uparatna varga	3	Practical Training 8.1	PSY-GUD	Shows-how	D,DL
CO 1,CO 2	Demonstrate SOP of Pishti Kalpana of Ratna-Uparatna	3	Practical Training 8.2	PSY-GUD	Shows-how	D
CO 3,CO 4	Identify the precious and semiprecious stones under Ratna and Uparatna varga using keys for mineralogical identification	3	Experiential-Learning 8.1	PSY-GUD	Shows-how	DIS,DA,P rBL
CO 1,CO 3,CO 4	Identify substitutes for Ratnavarga and Uparatna varga drugs	3	Experiential-Learning 8.2	PSY-MEC	Does	PSM,DIS, PBL,DA

M 8 Unit 2 SOP and therapeutic applications of Pishti, Gandhaka Druti and Gandhaka Taila kalpana2.1 Pishti Kalpana: Concept, SOP, and Therapeutic Applications

2.2. Classical concept of Druti

2.2 Gandhaka Druti and Gandhaka Taila Kalpana: Concept, SOP, and Therapeutic Applications

2.3 Pharmaceutical Modifications of Gandhaka Druti and Gandhaka Taila

References: 52,61,93,94,95,96,97,106,362,382,383,384,385,386,387,388

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss the concept, significance, and therapeutic value of Pishti kalpas	1	Lecture	CAP	Knows-how	BL,BS,DIS
CO 1,CO 6	Discuss the concept of Druti mentioned in Rasa classics and explore the therapeutic value of Gandhaka Druti and Gandhaka Taila	1	Lecture	CAP	Knows-how	DIS,L&GD,PER
CO 1,CO 7	Demonstrate different methods of Gandhaka Druti	2	Practical Training 8.3	PSY-GUD	Shows-how	DIS,D
CO 5,CO 8	Demonstrate Pharmaceutical modification of Gandhaka Druti and Gandhaka Taila	2	Practical Training 8.4	PSY-GUD	Shows-how	IBL,PAL,DIS,D
CO 1,CO 7	Prepare Pishti of Selected Ratna or Uparatna	3	Experiential-Learning 8.3	PSY-GUD	Shows-how	TPW,PrBL,CBL
CO 7,CO 8	Prepare Gandhaka Druti using different media	4	Experiential-Learning 8.4	PSY-GUD	Shows-how	DIS,L&PPT ,PrBL,D,TPW

Practical Training Activity

Practical Training 8.1 : Mineralogical identification of precious and semiprecious stones under Ratna and Uparatna varga

The teacher will select a precious or semi-precious stone and demonstrate its identification using identification keys. The teacher will then discuss the physico-chemical properties and crystallography of the identified specimen.

Practical Training 8.2 : Demonstration of SOP of Pishti Kalpana of Ratna-Uparatna

The teacher will select a drug from Ratna/Uparatna Varga and instruct students to prepare its Pishti under their supervision and guidance. Students will then prepare the Pishti according to the Standard Operating Procedure (SOP) and present their observations.

Practical Training 8.3 : Demonstration of different methods of Gandhaka Druti and Gandhaka taila

Under the direct supervision of the teacher, students will prepare Gandhaka Druti and Gandhaka Taila using various classical and modified methods as instructed. The

students will then discuss their observations, note the physico-chemical characteristics, and explore the therapeutic applications of the prepared formulations.

Practical Training 8.4 : Demonstration of the Pharmaceutical modification of Gandhaka Druti and Gandhaka Taila

The teacher will demonstrate the pharmaceutical modification of Gandhaka Druti/Taila into ointment/cream using suitable excipients. The students will observe the procedure and prepare the same under the guidance of the teacher.

Experiential learning Activity

Experiential-Learning 8.1 : Identification of the precious and semiprecious stones under Ratna and Uparatna varga using keys for mineralogical identification

The teacher will randomly assign a precious or semi-precious stone to each student. Students will then identify their assigned stone using identification keys, present their findings, and discuss the physico-chemical properties and crystallography of the identified specimen.

Experiential-Learning 8.2 : Identification of substitutes for Ratnavarga and Uparatna varga drugs

The teacher will assign each student a different precious or semi-precious stone and instruct them to identify at least one substitute from the museum and demonstrate the method of identification of the selected substitute. The students will present their findings and discuss the physico-chemical properties, crystallography, and pharmacology of the selected specimen.

Experiential-Learning 8.3 : Preparation of the Pishti of Selected Ratna or Uparatna

The teacher will assign each student a different drug from Ratna/Upartna Varga and instruct them to prepare the Pishti using various media for trituration. Students will then prepare the Pishti according to the Standard Operating Procedure (SOP) and present their observations.

Experiential-Learning 8.4 : Preparation of Gandhaka Druti using different media

The teacher will instruct each student to prepare Gandhaka Druti using various media (Tila Taila, Ghrita, Sarshapa taila) and different proportions. Students will then prepare the products, compare their physico-chemical properties, present their observations, and discuss

Modular Assessment

Assessment method

Conduct a structured Modular assessment. The assessment will be for 25 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points

Hour

2

Select any one of the activities for 25 marks each (1 x 25 = 25 Marks):

1. Presentation of Druti and Pishti Kalpa

2. Structured LAQ

3. Interaction/Viva voce

OR

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

OR

Any experiential learning method in converted form can be taken for assessment (25 marks)

Paper No : 2 Exposition of Ayurvedic Pharmaceutics						
Semester No : 3						
Module 9 : Scientific fundamentals of Ayurvedic Pharmaceutical preparations						
Module Learning Objectives (At the end of the module, the students should be able to) 1. Describe the classical Principles of drug processing and the scientific basis of Panchavidha Kashaya Kalpana 2. Evaluate Identity, Purity, and Quality of Raw Materials Used in Ayurveda Pharmaceutics 3. Conduct pharmaceutical processing of drugs with rationality 4. Analyze Ayurvedic Classical Dosage Forms and their integration with modern scientific validation						
M 9 Unit 1 Classical Principles of drug processing and scientific basis of Panchavidha Kashaya Kalpana 1.1 Bhaishajya Synonyms and significance of its knowledge 1.2 Classical principles of processing 1.3 Scientific review of Panchavidha Kashaya Kalpana and Upakalpana References: 90,237,238,239,240,243,244						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Discuss the rationality behind the selection of Panchavidha Kashaya Kalpana and compare classical and modern drug extraction techniques	1	Lecture	CC	Knows-how	BS,L&G D
CO 4	Demonstrate processing of unique Panchavidha Kashaya Kalpana with their ingredients, proportion of water and procedural details.	2	Practical Training 9.1	PSY-MEC	Does	

CO 4	Prepare unique formulation from the category of Panchavidha Kashaya Kalpana	3	Experiential-Learning 9.1	PSY-GUD	Shows-how	DL,D,SD L
M 9 Unit 2 Identity, Purity and Quality of Raw materials used in Ayurveda Pharmaceuticals 2.1 Classical knowledge about Identity, Purity, Quality of Raw material 2.2 Collection of Raw material- GACP, QAQC parameters 2.3 Adulteration and Contamination 2.4 Substitute drugs (Pratinidhi Dravya) References: 140,141,142						
3A	3B	3C	3D	3E	3F	3G
CO 3	Describe classical and contemporary parameters for quality assurance of raw drugs, as well as adulteration and contamination of the raw material.	2	Lecture	CC	Knows-how	ML,L&P PT
CO 3,CO 4	Demonstrate application of QAQC parameters used for quality control of herbal drugs	4	Practical Training 9.2	PSY-GUD	Knows-how	DL,LRI,D A
CO 1,CO 3	Identify and apply various tools and techniques used for quality control of raw materials. and appraise the classical rules of the collection of raw material.	6	Experiential-Learning 9.2	PSY-GUD	Shows-how	IBL,DIS, LS,ML
M 9 Unit 3 Pharmaceutical processing of drugs with its rationality 3.1 Processing of Drugs- Classical methodology 3.2 Simple and unique remedies from classical texts prepared with various processing methods 3.3 Rationality behind the Processing Method of Classical Dosage Forms 3.4 Siddhilakshanani (End-point assessment of pharmaceutical process) and its significance References: 90,102,237,238,239,240,243,244						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 4	Describe the classical and contemporary methods used for the processing of drugs	2	Lecture	CC	Knows-	L&PPT

	including the assessment of the End-Point(Siddhi Lakshanani) of the dosage form				how	,C_L,DIS
CO 1,CO 4	Demonstrate various formulations by describing their ingredients and understanding the uniqueness of their proportion.	5	Practical Training 9.3	PSY-MEC	Shows-how	D
CO 1,CO 2	Interpret significance of understanding the proportion of ingredients of formulations quoted in the classics	6	Experiential-Learning 9.3	CAN	Knows-how	REC,PrB L,IBL,LS, PL

M 9 Unit 4 Ayurvedic Classical Dosage Forms and their integration with modern scientific validation4.1 Classification of the source of raw material and the variety of dosage forms

4.2 Multiple factors responsible for Process optimization

4.3 Key qualities of good pharmaceutical products to ensure safety, efficacy, and authenticity.

4.4 Research updates about the Integration of traditional wisdom with modern scientific validation.

References: 14,15,16,18,41,42,43,44,45,46,47,49,50,51,56,90

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4	Recognize the factors responsible for a change in the concentration of the prepared drug. and assess the extracted phytochemicals with the help of TLC and other methods of analysis.	3	Lecture	CK	Know	L&GD,L S,BS
CO 1,CO 2,CO 4	Demonstrate the extraction of phytochemicals in the prepared dosage form.	4	Practical Training 9.4	PSY-GUD	Shows-how	PER,SY,P L
CO 1,CO 2	Perform the process of Extraction of Phytochemicals in Ayurvedic formulations	5	Experiential-Learning 9.4	PSY-GUD	Shows-how	ML,DIS,P rBL,BS,C _L
CO 1,CO 2	Describe multiple factors responsible for the process optimization of Ayurvedic pharmaceutical preparations and illustrate key qualities of good pharmaceutical products to ensure safety, efficacy, and authenticity.	2	Lecture	CAN	Knows-how	L&GD,T PW,L&P PT
CO 1,CO 2,CO	Demonstrate the kwatha preparation considering its process optimization	5	Practical	PSY-	Shows-	D,IBL,DI

4			Training 9.5	GUD	how	S
CO 1,CO 2,CO 4	Review Research Updates in the field of Ayurvedic pharmaceuticals along with modern scientific validation methods.	6	Experiential-Learning 9.5	AFT-VAL	Does	PL,BS,C_L,TBL,M L
Practical Training Activity						
Practical Training 9.1 : Demonstration of unique Panchavidha Kashaya Kalpana						
The teacher will instruct the students to explore the classical references for unique Panchavidha Kashaya Kalpana like, Agnisiddha and Anagni Siddha Swarasa, Saptavidha Kashaya Kalpana, Sagni and Niragni Hima Kalpana etc along with the commentaries, and outline all steps of each preparation. The students will perform the fselected practical under the observation and guidance of the teacher. Each student will perform a different formulation, record their observations, and discuss						
Practical Training 9.2 : Demonstration of the application of QAQC parameters used for quality control of herbal drugs						
The teacher will demonstrate the quality testing protocol of raw materials like organoleptic characters, estimation of foreign matter, bulk density, tapped density, extractive values, ash values, specific gravity, and refractive indexetc selecting an appropriate raw drug sample. The students will carry out the practical using different samples under the guidance of the teacher, record their findings, and compare them with the pharmacopoeial standards						
Practical Training 9.3 : Demonstration of formulations to understand uniqueness of proportion of the ingredients.						
The teacher will instruct each student to explore the classical references of the formulations from the classical texts with the help of the commentary, to understand the ingredients and their proportions. The students will demonstrate the following practical under the observation of the teacher, assess the End-Point(Siddhi Lakshanani) of the dosage form and its significance:						
• Lashona Kshirapaka						

- Sitopaladi Churna
- Bhallataka kalpa
- Medhya Rasayana from Charaka Chikitsa-sthana
- Kamsa haritaki
- Hingu dviruttara Taila

Practical Training 9.4 : Assessment of Phytochemicals in the prepared dosage form by TLC

The faculty will select a dosage form and demonstrate how to assess extracted chemical constituents using thin-layer chromatography (TLC). Each student will receive hands-on training. Students should be able to recognize the importance of the richness of classical references of a variety of formulations to understand the significance of alteration in their solvents, type of dosage form, and water proportion, which results in a change in the concentration of the prepared drug. They should assess the extracted phytochemicals with the help of TLC .

Practical Training 9.5 : Demonstration of Kwatha Kalpana considering its process optimization

The faculty will choose a specific kwatha from a classical text for each student. Each student will demonstrate the methodical preparation of allotted kwatha. Everyone will observe the changes that occur by varying the proportions of water, temperature, and time. To explore various factors that affect the optimization of the process, the same kwatha preparation will be conducted multiple times to note the differences.

Each student will be given drugs with different hardness and asked to prepare Kashaya using different ratio of water. The students will prepare kashaya samples, compare the time taken for the preparation, comparatively analyse them using organoleptic parameters and basic physico-chemical parameters and present their findings.

Experiential learning Activity

Experiential-Learning 9.1 : Preparation of unique formulation from the category of Panchavidha Kashaya Kalpana

Each student will enlist unique examples of formulations (minimum 10) of Panchavidha Kashaya kalpana from classical texts, and will enlist the steps of their preparation. All students will discuss to evaluate all dimensions of the formulations, viz. ingredients, water proportion, time required, therapeutic efficacy, samskaras performed, and the difference between various classical paribhasha.

Each student will prepare at least one formulation from each group, record the observations, present the same, and discuss. Each student will be allotted with different

formulation and the students will explore preparing the given formulation with different methods with due importance to heat, proportion etc and prepare the formulations, note their observations, present the same with scientific rationale.

Experiential-Learning 9.2 : Standardization of raw material used in Bhaishajya Kalpana.

Each student will refer to all volumes of quality standards for Indian medicinal plants and evaluate various tools and techniques used for the quality control of raw materials. The faculty will discuss the classical rules for collecting raw materials. A group discussion will be held to connect ancient parameters with current Good Agricultural and Collection Practices (GACP) and Quality Assurance and Quality Control (QAQC) parameters used to standardize herbal raw materials in Bhaishajya Kalpana. The teacher will allot each student a different raw material and instruct them to test the raw material for identity and quality based on both classical and modern pharmacopoeial parameters. After testing, the students will present their findings and compare them with classical and modern pharmacopoeial standards, and draw a conclusion regarding their quality standards

Experiential-Learning 9.3 : Interpretation of the significance of understanding the proportion of ingredients of formulations quoted in the classics

Each student will compile 6 examples of classical formulations of different dosage forms on the basis of the uniqueness of ingredients and their proportions. The faculty will discuss and explain its significance. Each student will demonstrate preparation of one formulation, present the findings and discuss the rationality behind the proportion of the ingredients

Experiential-Learning 9.4 : Performing the extraction of phytochemicals in Ayurvedic formulations.

All students will review publications (API, AFI, CCRAS, as well as databases, materia medica, and research publications). The faculty will organize a departmental seminar, where each student will present unique findings from their review. The theme of discussion will focus on the extraction of phytochemicals, and students will be encouraged to refer to in silico study reports.

The teacher will allot each student a different herbal raw material or formulation and instruct them to extract the drug in different solvents. After extraction, each student will test the drug for the presence of phytoconstituents using different methods and present their findings.

Experiential-Learning 9.5 : Review of Research Updates in the field of Ayurvedic pharmaceuticals along with modern scientific validation methods.

The faculty will assign specific topics for in-depth research on current trends and updates. Each student will refer classical and contemporary texts, online resources, scientific publications and prepare a PowerPoint presentation based on their findings. The topics may include:

1. Key qualities of good Pharmaceutical products

2. Safety Aspects of Ayurvedic Formulations
3. Factors responsible for the efficacy of formulations
4. Research articles on the process optimization of Ayurvedic formulations.
5. Integration of traditional wisdom with modern scientific validation in the field of Pharmaceutics

or any other relevant topics. After the presentation, the contents will be discussed and concluded with the expert comments of the teacher

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. Select any two activities for 25 marks each (2 x 25 = 50 Marks): A) Demonstration of Formulation-(25 marks) 1) Demonstration of any one practical from this module will be asked to perform. 2) Methodical Preparation- 10 marks 3) Written document for SOP- 5 marks 4) Questions answered on that – 5 marks B) PowerPoint presentation-(25 marks) Each student will prepare a PowerPoint presentation on any one topic and present to the department. Topics- 1. Key qualities of good pharmaceutical products 2. Safety Aspects of Ayurvedic Formulations 3. Factors responsible for the efficacy of formulations 4. Research articles on the process optimization of Ayurvedic formulations. 5. Integration of traditional wisdom with modern scientific validation in the field of Pharmaceutics 6. Substitute drugs. OR Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential learning method in converted form can be taken for assessment (25 marks)	4

Module 10 : Principles of pharmaceutical formulation

Module Learning Objectives

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

- 1) Develop an insight to understand and analyse the rationality of designing compound drugs.
- 2) Assess the principles and practices of processing the particular dosage forms.
- 3) Identify and investigate methods of potency enhancement (Shaktutkarsha) from classical references.
- 4) Recognize and integrate similar principles of drug processing from Ayurvedic classical and Modern Pharmaceutical science

M 10 Unit 1 Principles of Samskara (transformative processes of drug manufacturing) in relation to drug development
1.1 Qualities of drugs/Procedures involved in the preparation of dosage forms
1.2 Classical concept of Samskara and expected alterations in qualities
1.3 Key role of Samskara in pharmacological and therapeutic modification of the drug
1.4 Modifications in samskaras in current practices and their consequences

References: 90,240,241,243,244

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Describe the applied principles of samskara involved in the preparation of various kalpana..	2	Lecture	CAP	Knows-how	L&GD,L &PPT ,L_VC
CO 1,CO 2,CO 8	Illustrate the role of samskaras in the changes observed during the preparation of various dosage forms according to classical texts.	4	Practical Training 10.1	PSY-GUD	Shows-how	D,DIS

M 10 Unit 2 Rationality behind Composition of Formulations
2.1 Combinations of ingredients (desirable/ inadmissible)
2.2 Rational integrity behind the combination of ingredients

2.3 Aushadhi Gana (therapeutic groups) or Varga (categories) of medicinal herbs and their role in formulations
 2.4 Combinations based on predominant pharmacological actions, qualities, or therapeutic usage of the ingredients.

References: 143

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Analyze the purpose of composition and combinations of ingredients in classical formulations.	2	Lecture	CAN	Knows-how	L&GD,L,BS,L&PP T ,L_VC
CO 1,CO 2,CO 8	Demonstrate combinations of various classical formulations and justify the rationale behind the ingredients.	4	Practical Training 10.2	PSY-GUD	Shows-how	DL,D

M 10 Unit 3 Principles and designing of various dosage forms
 3.1 Principles of dosage form design
 3.2 Pharmaceutical Considerations
 3.3 Formulation Considerations
 3.4 Biopharmaceutical Considerations
 3.5 Pharmacokinetic Considerations

References: 144,187,262,269,270,316,367,368,369,370,371

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Justify the Principles of dosage form design as per modern pharmaceutical science.	2	Lecture	AFT-VAL	Knows-how	BS,L_VC
CO 1,CO 2,CO 8	Demonstrate various designs of dosage forms, considering all fundamentals of pharmacology	6	Practical Training 10.3	PSY-GUD	Shows-how	D,DL

M 10 Unit 4 Principles of Prakshep dravyas (Pharmaceutical Additives)
 4.1 Prakshepa Dravya- Need, Importance, Proportion (matra)
 4.2 Pharmaceutical Excipients

References: 90,372,373

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Identify the selection and relevance of Prakshepa dravya added to various dosage forms. and describe Pharmaceutical excipients.	2	Lecture	CC	Knows-how	DIS,L&G D
CO 1,CO 2,CO 8	Demonstrate and analyze the importance of pharmaceutical excipients	6	Practical Training 10.4	PSY-GUD	Shows-how	DL,D,TP W
CO 1,CO 2,CO 8	Illustrate various Prakshepa Dravyas and their proportions stated in the classics.	6	Experiential-Learning 10.1	PSY-MEC	Shows-how	SDL,BS,PER,LS,IB L

M 10 Unit 5 Principles of Potency and Efficacy enhancement
5.1 Classical principles of Potency and efficacy enhancement (Shaktyutkarsha)
5.2 Methods of Potency and Efficacy Enhancement in Ayurvedic Classics
5.3 Methods of Potency and Efficacy Enhancement in Modern Pharmaceutics

References: 6,22,84,90,149,150,151,152,153,154,155,156,243,244

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Describe and compare various techniques used in the classics for Shaktyutkarsha (Potency enhancement)	2	Lecture	CAN	Knows-how	L&GD,L_V C,L
CO 1,CO 2,CO 8	Justify the need for Shaktyutkarsha (Potency enhancement)in drug preparation and Advocate techniques of potency enhancement used in Ayurvedic pharmaceutics.	10	Experiential-Learning 10.2	PSY-MEC	Does	D,BS,DL, DIS
CO 5,CO 7,CO 8	Investigate the principles for improving potency and efficacy in modern pharmaceutics	10	Experiential-Learning 10.3	CS	Knows-how	SDL,DIS, PER,LS,B S

Practical Training Activity

Practical Training 10.1 : Demonstration of Samskara and alterations in the qualities observed during the preparation of Ayurvedic dosage forms.

DOAP (Demonstrate/ Observe/ Assist/ Perform) following practicals and discuss the probable changes on the initial raw drug after performing the samskara. Discuss the key role of samskara and modifications in samskaras done in current practices.

1. Toyasannikarsha- Patoladi Kwatha, Mustadi Pramathya
2. Agni Sannikarsha- Triphala Mashi, Arka Lavana
3. Shaucha- Odana
4. Manthana- Takra, Masuradi Mantha
5. Desha- Dhanyarashimadhye Sthapana/ Bhasmarashimadhye Sthapana
6. Kala- Duralabhasava
7. Vasan- Keep Ushira/ Musta/ Mallika flowers in the water and observe the fragrance extracted in the water after some time)Ghreya yoga(Ch. Ka. 3/11,12)
8. Bhavana- Chaushashta Pippali
9. Kalaprakarsha- Observe any sandhana kalpa kept in the department after regular intervals of three months. Study and prepare Trivrut Sura
10. Bhajana- Triphala rasayana (Ayas patra lepana) Chatuh kuvalaya Ghruta)
11. Peshana- Shatadhauta Ghruta.-dhavana and mardana/Peshana 100 times. Justify Peshana of Maricha done one by one in the preparation of Shvasakuthar rasa
12. Abhimantrana- Ayushkama Rasayana

or any other relevant examples can be considered.

Practical Training 10.2 : Demonstration of formulations prepared with specific Aushadhi Gana and various classes(Vargas) from classics.

The faculty will allot one practical per student from any of the group of drugs (Gana) mentioned in classics (Deepaneeya Dashemani, Varnya Mahakashaya etc). Each student will research classical references for formulations made from drugs within the same group, followed by hands-on training for their preparation. All students will share the details of their practical experiences with each other. Discuss the examples of Aushadhi Gana and varga of medicinal herbs and their role in various formulations

Practical Training 10.3 : Demonstration of Dosage Form Design.

Faculty will arrange a group discussion on the Principles of dosage form design in Modern Pharmaceutical Science

- 1) Pharmaceutical and Formulation considerations for dosage form design
- 2) Biopharmaceutical and Pharmacokinetic considerations for dosage form design

Each student will develop and demonstrate any 2 formulations(for example- Mouthwash from Triphala decoction, Tooth paste from Bakula Pushpa churna, Ointment from

Vrana Shodhana Taila, Cream from Kunkumadi taila, etc.)

Practical Training 10.4 : Demonstration and analysis of the importance of preservatives, additives, excipients, fillers, etc.

The faculty will facilitate the group activity for the preparation of a selected Avaleha/ paka/ Khanda/ Asava/ Arishta formulation where different pakshepaka/additives used. A critical discussion will be carried out to analyze the role of prakshepa dravya in the formulations.

Each student will identify and demonstrate any 2 formulations wherein excipients/ Colouring agents/ Fillers/ Preservatives are used

Experiential learning Activity

Experiential-Learning 10.1 : Illustration of various Prakshepa Dravyas and their proportions stated in the classics.

All students will summarize the list of Prakshepa dravyas in the library session and assess the identity, purity, quality, and guna karma of the following Prakshepa dravyas-

1. Madhu
2. Sita/sharkara
3. Guda
4. Kshara
5. Lavana
6. Ghruta
7. Taila
8. Churna- Jiraka, Shunthi, Hingu, Pippali, Trikatu, Chaturjata
9. Kalka
10. Drava- Jala, Ksheera, Madya, Mutra
11. Guggulu
12. Shilajit

- Faculty will allot 2 or 3 prakṣhepa dravya for studying, and each student will submit an essay based on the findings.
- Each student will prepare at least 2 Formulations from the following (or any other) to understand the importance of Prakṣhepa Dravya-

1. Brahmi Svarasa
2. Vasa kvatha with different combinations
3. Draksha Phanta
4. Rasona Kalka
5. Narikela Khandapaka
6. Khadirarishta

Experiential-Learning 10.2 : Classical techniques of Shaktyutkarsha/ Potency enhancement

The faculty will plan a workshop where all the students will demonstrate the following or any relevant practical-

- 1) Ghana Nirmana- Kutaja Ghana
- 2) Bhavana- Shatabhavita Amalaki Rasayana
- 3) Punaravartita Paka-Anu Taila Nirmana
- 4) Sura Nirmana-Rasona Sura(Chakradatta, Bhaishjya Ratnavali- Aamavata)
- 5) Addition of Yogavahi Dravya- addition of Pippali/Kajjali/ Rasasindura

Students will compile classical examples of formulations that utilize shaktyutkarsha techniques. A brainstorming session will be conducted following the faculty's concluding remarks.

Experiential-Learning 10.3 : Evaluation of Methods used to improve potency and efficacy in modern pharmaceuticals

A brainstorming session will be arranged in which the allotted topics will be presented by all students based on their survey about -

1. Adjunctive drugs/ Bioenhancers
2. Synergism
3. Enhancement of potency and reduction in dose required
4. Solubility
5. Permeability
6. Estimation of blood serum level of phytoconstituents
7. Receptors/ targeted tissue and drug designing
8. Nanocarrier-mediated subcellular targeting

OR

Faculty may organize a seminar on Modern Pharmaceutics by inviting subject matter experts or students can study by watching video recordings ensuring that the listed topics are covered to stay updated with relevant information from Modern Pharmaceutical Science.

OR

Refer to high-impact articles and discuss them in your journal club.

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point per the Table

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

A) SAQ – Open book Written test (25 marks)

5 questions, each of 5 marks, will be given based on M10.U3 and M10.U5

B) Essay Writing-(25 marks)

Each student will submit a short essay (minimum 1000 words) on any one topic-

1) Punaravartita snehapaka and shaktutkarsha

2) Baladhana by Bhavana

3) Methods of potency enhancement in Modern Pharmaceutics

4) Key role of samskara in ayurvedic pharmaceutics

5) Panchashat mahakashaya and the rationality behind the combination of drugs in those groups

6) Unique features of Shodhanadi Ganasamgraha adhyaya (A. Hr. Su. 15)

4

7) Principles of Dosage Form Design.

8) Pharmaceutical additives

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Semester No : 4

Module 11 : Mana Paribhasha (Metrology in Ayurvedic Pharmaceutical preparation)

Module Learning Objectives

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

- 1) Describe the importance of Mana for various pharmaceutical preparations
- 2) Demonstrate preparation of specific classical formulations exhibiting the importance of considerations regarding Mana.
- 3) Distinguish the differences/ alterations that occurred due to the application of Volumetric and Gravimetric methods
- 4) Discuss the Standard Units of Measurement of the current times
- 5) Assess the effects of bulk production on the end products in the Ayurvedic Pharmaceutical Industry

M 11 Unit 1 Mana Paribhasha (Classical system of measurement)1.1 Importance of accurate measurements in proportions of ingredients

1.2 Importance of accurate measurements in dosage and administration of drugs

1.3 Types of Mana and details of classical units used for measurement (Weight/ Volume/ Length/ Time)

References: 88,90,102,423,424,425

3A	3B	3C	3D	3E	3F	3G
CO 1	Recall classical knowledge of Mana Paribhasha with a comparison of various classical	1	Lecture	CAN	Knows-	IBL,PL,R

	texts.				how	EC,LS,S DL
CO 1	Interpret the application of Mana in classical formulations with a variety of examples.	1	Lecture	CAP	Knows- how	DIS,BS,L &GD,IBL
CO 1,CO 2	Apply the Knowledge of mana Paribhasha in the preparation of various formulations	4	Practical Training 11.1	PSY- GUD	Shows- how	D,PL,TB L,PBL
CO 1,CO 2	Compare and judge the differences in the Mana mentioned by different classics.	6	Experiential- Learning 11. 1	PSY- ADT	Does	SDL,BS,P BL,DIS

M 11 Unit 2 Standard Units of Measurement
 2.1 AYUSH Unit Converter
 2.2 Utility of converted units in the preparation of Classical formulations

References: 418,419

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Describe standard units of weights and measures and AYUSH Unit Converter.	1	Lecture	CK	Knows- how	ML,LS,L &GD
CO 1,CO 2	Preparation of charts of unit converter (Ayurvedic Mana- Metric)	2	Practical Training 11.2	PSY- MEC	Shows- how	PSM,IBL, ML,SDL
CO 1,CO 2,CO 4	Demonstrate preparation of classical formulations prepared with converted Units	3	Experiential- Learning 11. 2	PSY- ADT	Shows- how	PAL,DL, D

M 11 Unit 3 Volumetric Vs Gravimetric Methods
 3.1 Key differences between Volumetric and gravimetric methods of measurement for a variety of drugs
 3.2 Application of volumetric method for preparation of various classical formulations
 3.3 Variation in proportion by using both methods and alteration in outcome

References: 88,90,102

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4	Define the terms Volumetric methods and Gravimetric methods and apply the methods of both measurements to Ayurvedic Pharmaceutical Preparations.	1	Lecture	CAP	Knows-how	TBL,L&P PT
CO 1,CO 2,CO 4	Apply and demonstrate the volumetric method for the preparation of classical formulations	2	Practical Training 11.3	PSY-GUD	Shows-how	RLE,PAL
CO 1,CO 2,CO 4	Justify and interpret differences occurring in the final product prepared by varying the weight of the ingredients once taken by volume and once taken by mass(Gravimetric Method)	3	Experiential-Learning 11.3	PSY-GUD	Shows-how	DIS,TBL

M 11 Unit 4 Rationality of Proportion of Ingredients in Ayurvedic formulations4.1 Factors accountable for deciding the proportion of ingredients of the formulation

4.2 Profile of Raw Material (Fresh/ dry, Soft/ hard, part used, therapeutic properties, compatibility, etc.)

4.3 Rules for Duplication of ingredients in the same formulation

References: 90,102,237,238,239,240,241,243,244,262,274,278,282

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4	Describe the classical rules and principles for the proportion of ingredients based on raw material and its nature/ Qualities	3	Lecture	CC	Knows-how	L&PPT ,IBL
CO 1,CO 2,CO 4	Demonstrate the skill of preparing formulations with a diverse range of raw materials.	6	Practical Training 11.4	PSY-MEC	Shows-how	PrBL,RL E,PSM,SDL
CO 1,CO 4	Analyze and justify the proportions of ingredients of classical formulations	7	Experiential-Learning 11.4	PSY-ADT	Does	SDL,PBL ,IBL,LS, DIS

M 11 Unit 5 Bulk production of Ayurvedic Formulations5.1 Modifications expected for bulk production (in Material, Machine, Method, Mechanism)

5.2 Material- Type, proportion, effect of temperature pattern

5.3 Machine used for bulk manufacturing and automated drug manufacturing

5.4 Mechanism of machines used for bulk production and its merits and demerits

5.5 Methods used for bulk production in Ayurvedic Pharmacies and probable alterations in the qualities of the end products.

References: 420,421,422

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 7,CO 8	Enlist the machines, heating devices for bulk production. and describe their methods currently used by Ayurvedic pharmacies f	3	Lecture	CC	Knows-how	DIS,IBL, L_VC,M L,L&GD
CO 7,CO 8	Demonstrate the use of machinery used for large-scale production in Ayurvedic pharmacies, with their mechanism	6	Practical Training 11.5	PSY-MEC	Shows-how	PrBL,IBL ,D-M,FV
CO 4,CO 7,CO 8	Debate on merits and demerits of bulk production and the adaptation of advanced machines in Ayurvedic Pharmacies.	7	Experiential-Learning 11.5	PSY-ADT	Does	IBL,DIS, RLE,BS

Practical Training Activity

Practical Training 11.1 : Application of Knowledge of mana Paribhasha in the preparation of various formulations

The students will design a chart of classical manaparibhasha applied to Ayurvedic Pharmaceutical preparation of Various dosage forms. They will study the following examples for evaluating the use of mana paribhasha in the preparation of the following classical formulations. Accordingly, each student will prepare a selected formulation from the list given below or any other relevant formulation under the direct observation of the teacher.

1. Bhagottara churna
2. Bahushal Guda
3. Yogaraja guggulu
4. Kutajavaleha
5. Kasisadya ghruta
6. Kutajarishta

7. Lauhadi Rasayana - critically appraise the measurements mentioned for Ayurveda

8. Pathya Ghruta

Practical Training 11.2 : Unit Conversion for Pautava and Druvaya Mana

Each student will study the Unit Converter for Pautava and Druvaya Mana

Each student will select any 10 Dry samples of various sources and observe their mana based on unit conversion.

A discussion will be held on the observations and application of this information.

Practical Training 11.3 : Preparation of Formulations using the Volumetric Method of Measurement

Faculty will describe the differences between volumetric and gravimetric methods of measurement for various drugs, allowing students to explore the application of the volumetric method in preparing classical formulations.

Preparation of Amruta Kwatha, Bala Kwatha, Kutaja Kwatha, Sharavari Kwatha, and Bhrungaraja Kwatha will be done using the volumetric method for measurement.

Faculty will elaborate on the difference in the total amount of water required for the formulations when water is measured using the volumetric method.

Verify the difference observed between the total amount of water required for the formulation when water is taken by the volumetric method.

Practical Training 11.4 : Preparing formulations with a diverse range of raw materials.

Faculty will elaborate on how to identify the type of raw drug and prepare that formulation following the SOP when the raw material used is -

1. Shushka or Aardra
2. Mrudu- Madhyama- or kathina
3. Root/ flower/ bark/ stem

An example for each will be selected, and the student will prepare the same under the direct observation of the teacher. Discussion will focus on the differences observed in the extraction of active components based on the qualities of the raw drug.

Practical Training 11.5 : Demonstration of the machinery used for large-scale production in Ayurvedic pharmacies, with their mechanism

The department will arrange a visit to a pharmacy where bulk production is carried out using advanced machinery.

OR

A video demonstration will be arranged to cover the assembly and operation of the equipment used for bulk production. Each student will-

- Observe and understand the working of these machines, along with understanding their working principle.
- Operate these machines in the teaching Pharmacy unit.
- Assess the modifications and impacts of bulk production on the final product.
- Explain the structure and operation of all these machines.
- Discuss with production unit personnel about the advantages and disadvantages of the machines used in Ayurvedic pharmacies.

Experiential learning Activity

Experiential-Learning 11.1 : Mana Paribhasaha from classics and its importance for preparing classical formulations.

Each student is allotted different types of Mana like Poutava, Paayya, Druvaya, Kala Mana, etc. The students will compile various references about the given Mana, find the metric equivalent, and compare them. They will present their findings and discuss. The teacher will instruct each student to collect the materials mentioned in Mana Prakarana, like Masha, Aksha etc, and measure multiple samples of the same, present the average weight/volume/length of the same, and compare with the API standards.

Experiential-Learning 11.2 : Preparation of Classical Formulations by applying knowledge of converted units

Group activity will be planned to identify classical formulations that utilize a variety of druvaya (substances) and pautava mana (qualities) as ingredients. Aim to demonstrate at least five formulations with their measurements converted to a standard unit.

Have Brainstorming sessions / PBL sessions and discuss the following questions.

1. How would you address those who argue that focusing on classical formulations may overlook modern advancements in ingredient efficacy that could improve formulations?
2. Have you considered the perspective that the complexity of druvaya and pautava mana could complicate the reproducibility of these formulations?

Experiential-Learning 11.3 : Application of classical knowledge of Mana paribhsha with understanding its effect on preparing formulations.

The group will observe seeds and fruits used to measure the ingredients mentioned in the classics. Compare and justify the difference when volumetric and gravimetric methods are used.

Each student will demonstrate two formulations from the Sushruta Samhita to show how the qualities of the end product change when prepared using volumetric and gravimetric methods.

Experiential-Learning 11.4 : Significance of proportion of ingredients

. Brainstorming sessions will be conducted within the group. The group activity can be organized in the following steps:

1. Identification of formulations where the same ingredient is duplicated.
2. Understanding the rules and principles regarding the quantities and proportions used in classical formulations.
3. Analyzing five classical formulations, focusing on the quantity and proportions of raw materials used. Preparation of these formulations to observe the changes.(Each student will prepare one formulation)
4. Explore examples of formulations that mention variations in the proportion of water.
5. Assess how changes in water proportions affect the extractive values of the active components in the raw materials.
6. Justify the principles related to the quantity of formulation that should be prepared at one time in a single batch, and discuss how proportions may change when preparing on a larger scale.

Each student will be allotted a selected practical and asked to prepare with the same proportion mentioned in the classics and with an altered proportion. After the preparation, the sample will be tested with organoleptic and physico-chemical parameters, and comparative observations are presented and discussed

Experiential-Learning 11.5 : Assessment of advanced tools and techniques used currently for manufacturing Ayurvedic formulations.

Group activities will be conducted, which may include the following points:

1. Assessment of classical knowledge about Samskaras and the qualitative changes that occur during drug preparation.
2. Interpret the role of fuels and heating devices during Agni Sannikarsha Samskara, particularly about Pakajotpatti and thermodynamics. Study different dosage forms to gain a better understanding.
3. Analyze the changes in proportions made or anticipated during the bulk production of dosage forms.
4. Engage in discussions with personnel from the manufacturing unit to identify the advantages of bulk production and the machinery used in the process.

Modular Assessment

Assessment method

Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade

Hour

4

point as per Table 6C.

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

A) Essay Writing- 25 Marks

Importance of Metrology in Ayurvedic Pharmaceutics

B) Spotting Examination- 25 Marks

5 Machines/ Models or pictures of Machines will be kept as spotter, and students will write answers to the questions asked. (Identification of the machine, Mechanism, Merits and demerits, dosage forms prepared with that machine, calibration, etc.)

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Module 12 : Process validation Protocol

Module Learning Objectives

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

- 1) Describe the process of preparation of Dosage forms with classical references.
- 2) Demonstrate the pharmaceutical procedure for dosage forms, including each step.
- 3) Present documented plan (Protocol) to confirm that the production process used for manufacturing the product performs as intended.
- 4) Assess and interpret the process validation protocol of Modern Dosage Forms

M 12 Unit 1 Pharmaceutical Preparation process: Classical Dosage forms 1.1 Primary Dosage forms- Panchavidha Kashaya Kalpana and their Upakalpana
1.2 Secondary Dosage Forms- Avaleha Kalpana, Lavana Kalpana, Sneha Kalpana, Gutti-vati-guggulu kalpana, Sandhana Kalpana, Arka-Kalpana, Kshara-kalpana
1.3 Topical Dosage forms- Lepa kalpana, Malahara Kalpana, Upanaha Kalpana

References: 56,90,104,240,241,243,244

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Describe the SOP of Primary dosage forms, Secondary dosage forms, and topical dosage forms.	3	Lecture	CC	Knows-how	L,L_VC, TBL
CO 1,CO 2,CO 8	Assess the significance of the Process Validation Protocol.	2	Lecture	CE	Knows-how	L_VC,PE R,L
CO 1,CO 2	Demonstrate the development of a process validation protocol for Ayurvedic dosage forms.	10	Practical Training 12.1	PSY-GUD	Knows-how	D
CO 1,CO 2	Develop a process validation protocol for Ayurvedic dosage forms.	10	Practical Training 12.2	PSY-GUD	Shows-how	D
CO 1,CO 2	Interpret the documentation related to Standard Operating Procedures (SOPs) used in pharmacies.	6	Experiential-Learning 12.1	PSY-GUD	Shows-how	D,PrBL
CO 1,CO 2	Prepare unique classical formulations following constructed SOP	10	Experiential-Learning 12.2	PSY-GUD	Knows-how	PrBL,D

M 12 Unit 2 Pharmaceutical Preparation process: Recent advances of Dosage forms
 2.1 Principles of processes viz. Expression, Extraction, Maceration, Percolation, Infusion, Distillation, Active principle isolation, Particle size reduction, Separation Techniques, Mixing
 2.2 Solid Dosage forms- Powders, Pills, Tablets, Capsules, Soft gel capsules, Gummies, Lozenges, Granules.
 2.3 Liquid Dosage Forms- Emulsions, Suspensions, Lotions, Liniments, Elixir, Syrup, Nasal Drops, Gargle
 2.4 Semi-solid dosage forms- Ointment, Gel, Paste, Cream, Plasters, Suppositories
 2.5 Gaseous dosage forms- Aerosols, Nasal Spray, Inhalers

References: 84,157,158,159,160,161,269,402,403,404,405

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 3	Describe principles of different dosage forms, viz. Extraction, Maceration, Percolation, Infusion, Distillation, Active principle isolation, Particle size reduction, Separation	2	Lecture	CC	Knows-how	IBL,ML, DIS,PrBL

	techniques, and Mixing techniques.					,L
CO 1,CO 4	Discuss Pharmaceutical Preparation Process of Solid, semisolid, liquid, and gaseous dosage forms.	3	Lecture	CC	Knows-how	L,ML,IB L,JC,L&P PT
CO 2,CO 8	Prepare different novel modern dosage forms of the given drug.	5	Experiential-Learning 12.3	PSY-GUD	Shows-how	PrBL,D
M 12 Unit 3 Novel Dosage and drug delivery Forms 3.1 Importance and Need of Different Dosage Forms in Drug Delivery Systems and Treatment Modalities. 3.2 Definition, significance, technologies driving Novel dosage forms, applications, and challenges 3.3 Modification of different dosage forms 3.4 Potential areas for future research and development References: 84,402,403,404,405						
3A	3B	3C	3D	3E	3F	3G
CO 2,CO 8	Analyze, justify, and demonstrate the importance and need of the preparation of Novel dosage forms	5	Experiential-Learning 12.4	PSY-GUD	Shows-how	ML,LS,IB L,DIS
Practical Training Activity						
Practical Training 12.1 : Develop Process validation Protocol and demonstrate the preparation of formulations following SOP						
Each student will conduct practical sessions (Minimum 5 for each PG student) for undergraduate students, demonstrating, observing, assisting, and performing the following practicals as part of their NCISM curriculum. 1. Swarasa- Mandukaparni swarasa, 2. Kalka- Nimba Kalka,						

3. Kwatha- Punarnavashtaka kwatha
4. Hima- Sarivadi hima,
5. Phanta- Yashtimadhu phanta
6. Churna- Panchasakara churna
7. Siddha Jala- Shadanga paneeya
8. Tandulodaka
9. Kheerapaka- Arjuna ksheerapaka,
10. Pramathya- Mustadi pramathya,
11. Panaka- Chinchā panaka
12. Mantha- Kharjuradi Mantha
13. Laksharasa
14. Avaleha- Vasavaleha
15. Lavana- Abhaya Lavana
16. Sneha Kalpana- Nirgundi tail, Panchagavya Ghruta
17. Gutī-Vatī- Rasonadi Vatī
18. Guggulu Kalpana- Panchtikta ghrita guggulu,
19. Sandhana Kalpana- Kharjurasava

Practical Training 12.2 : Develop Process validation Protocol and demonstrate the preparation of formulations following SOP

Each Student will conduct practical sessions for undergraduate students(Minimum 3 for each PG student) to demonstrate, observe, assist, and perform the following practical as part of their NCISM curriculum.

- 1) Arka- Gomutra arka
- 2) Kshara-Palasha kshara
- 3) Lepa- Dashanga lepa
- 4) Malahara- Gairikadya malahara
- 5) Upanaha- Atasi upanaha

- For Netra Kalpana- Seka, Ashchyotana, Pindi, Bidal, Tarpana, Anjana, Putapaka- (Observe in Shalakya Netra department)

Experiential learning Activity

Experiential-Learning 12.1 : Studying the documentation related to Standard Operating Procedures (SOPs) used in pharmacies.

The department will arrange the visit to least one teaching pharmacy or a nearby GMP-approved pharmacy. The students during their visit will review their documentation related to process validation or observe their preparation plan following SOPs. Each student will write at least one protocol after the visit.

Experiential-Learning 12.2 : Construct a protocol for unique classical formulations and prepare the selected product following SOP

The teacher will allot each student with a different classical formulation that has a unique method of preparation. The students will develop a Standard Operating Procedure (SOP) protocol that involves a structured approach to ensure the processes' consistency, quality, and compliance. An SOP template may typically include: Title, Purpose, Scope, Definitions, Responsibilities, Procedures, References, Revision History. The checklist should include required materials, Safety precautions, Step-by-step instructions. Discussion sessions will be conducted to ensure that everyone understands the SOP and knows how to implement it effectively. The students will search and study relevant research papers.

Each student will carry out any one practical based on the SOP developed, present their observations and discuss. The list of formulation may include the following (or any other relevant formulation):

- 1) Avaleha- Chyavana prasha, Haridra Khanda
- 2) Taila- Apamargakshara taila, Pinda Taila, Vajra Taila
- 3) Ghruta- Amalaka Ghruta, Kalyanaka Ghruta
- 4) Sandhana Kalpana- Lohasava, Takrarishta
- 5) Lavana- Sushruta samhita- Patra Lavana, Kanda Lavana

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Experiential-Learning 12.3 : Preparation of Prepare different novel modern dosage forms

The faculty will organize a workshop focused on practical training in modern dosage forms.

OR

will arrange an educational visit to a nearby GMP-certified drug pharmacy or a well-regarded pharmacy college. This visit will provide an opportunity to observe and assist

in the preparation of modern dosage forms.

OR

will incorporate video recordings to train participants on the Standard Operating Procedures (SOP) for preparing modern dosage forms.

This should include,

Demonstrate SOP for-

1. Solid dosage forms - Powders, Pills, Capsules, Tablets, Capsules, Lozenges.
2. Liquid dosage forms - Emulsions, Suspensions, Lotions, Liniments, Syrups, Nasal Drops, Gargle.
3. Semi-solid dosage forms - Ointments, Suppositories, Gel, Paste, Cream. Plasters, Suppositories.
4. Gaseous dosage forms- Aerosols, nasal Spray, Inhalers.

Experiential-Learning 12.4 : Overview of Novel Dosage Forms.

After conducting a thorough search by all students in the library and on mobile platforms for relevant articles, the Faculty will arrange a departmental seminar on the topic: "Overview of Novel Dosage Forms." The discussion will focus on the ongoing evolution of healthcare and how the development of advanced formulations is crucial for delivering safe and effective treatments to patients.

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. Group Discussion – 50 marks The group discussion on Overview of Novel Dosage forms will be observed by the faculty, and an assessment will be made of the compilation done and the participation of the student in the activity. OR Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential learning method in converted form can be taken for assessment (25 marks)	4

Semester No : 5

Module 13 : Krutanna (Ayurvedic Food Preparations)

Module Learning Objectives

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

- 1) Discuss the difference between Ahara and Aushadhi.
- 2) Describe the conceptual uniqueness of Ayurvediya Aahara-Kalpana.
- 3) Justify the importance given to Aushadhi siddha Aahara (therapeutic diet), explained in classical literature.
- 4) Interpret the importance of Aushadhi siddha Aahara (therapeutic diet) in the current healthcare sector.
- 5) Formulate a few Aushadhi Siddha Aahara Kalpa and correlate them with Nutraceuticals, Functional Foods, Dietary Supplements, and Therapeutic Diets.

M 13 Unit 1 Classification of food substances and Formulations

1.1 Ayurvedic dietary principles and Ahara Dravya Varga (Groups of food substance)

1.2 Aahara -mahabhaishajya: Significance of food substances used as medicine

1.3 Unique classical formulations prepared using Food substances belonging to various groups and their utility in treatment

References: 237,238,239,240,241,243,244

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 4	Describe Ayurvedic dietary principles and the significance of food substances used as medicine.	2	Lecture	CC	Knows-how	L&PPT ,PrBL,L&GD
CO 1,CO 2	Demonstrate the method of preparation of distinctive formulations using Aahara Dravya from different groups (Vargas).	4	Practical Training 13.1	PSY-GUD	Shows-how	PL,IBL,PrBL
CO 1,CO 2	Prepare distinctive formulations using Aahara Dravya from different groups (Vargas)	6	Experiential-Learning 13.1	PSY-GUD	Does	BS,C_L,DL,LS

M 13 Unit 2 Customized food for treatment 2.1 Disease-specific Ayurvedic Aahara- Therapeutic utility 2.2 Samsarjana krama- Manda, Peya, Vilepi, Yavagu, Yusha, Odana, Krushara, Mansarasa- Process validation Protocol for all formulations 2.3 Personalised prescription of Aushada Siddha Aahara for Shamana and during panchakarma References: 162,163,164,426,427,428,429,430						
3A	3B	3C	3D	3E	3F	3G
CO 2,CO 6	Describe disease-specific diet formulations	2	Lecture	CC	Knows-how	DIS,PBL, L&PPT ,ML,IBL
CO 2,CO 6	Demonstrate preparation of therapeutic diet formulations	4	Practical Training 13.2	PSY-GUD	Shows-how	SDL,PrB L,D
CO 2,CO 4,CO 6	Identify and prepare disease specific Ayurvedic Ahara	6	Experiential-Learning 13.2	PSY-GUD	Shows-how	BS,D,IBL ,SDL,CB L
CO 1,CO 6	Recite paribhasha and describe the importance of Yusha, Yavagu, Odana, and Mamsarasa.	2	Lecture	CC	Knows-how	SDL,REC ,DIS,L&P PT
CO 1,CO 2,CO 4	Demonstrate the method of preparation of various Aahara Kalpana	4	Practical Training 13.3	PSY-GUD	Shows-how	TBL,DL, D,SDL
CO 1,CO 6	Develop the disease-specific Personalised prescription of Aushadhi Siddha Ahara.	6	Experiential-Learning 13.3	PSY-GUD	Does	RLE,DIS, CBL,D-BED,BS
M 13 Unit 3 Ayurvedic Food Industry 3.1 Market survey about Ayurvedic food products and research updates 3.2 Global needs and designing of modified food formulations 3.3 Semi-processed food/ semi-cooked food, RTC- ready to cook / RTD-Ready to drink Foods and drinks 3.4 Regulation Standards for Ayurvedic Food Preparation (Ayurveda Aahara Regulations- 2021), FSSAI Regulations						

References: 164,165,166,167,431

3A	3B	3C	3D	3E	3F	3G
CO 5	Describe the regulation standards for Ayurvedic food preparations- FSSAI (Ayurveda Aahara regulations)	2	Lecture	CK	Know	LS,L&PP T ,L_VC
CO 5,CO 8	Demonstrate the preparation of novel Ayurvedic food products	4	Practical Training 13.4	PSY-GUD	Does	FV,IBL,R LE,PrBL
CO 1,CO 2,CO 5	Collect the data and interpret the findings through a market survey to explore the available Ayurvedic food products and assess the current trends in the Ayurvedic food industry.	4	Experiential-Learning 13.4	PSY-GUD	Does	TPW,DIS ,BS,PrBL

M 13 Unit 4 Food processing technology traditional and modern methods4.1 Traditional Methods- Steaming, Boiling, Drying, Salting, Smoking, Frying, Marinating, Pickling, Fermentation,
4.2 Modern Methods- Heating, Freeze Drying, Vacuum Drying, Canning, Juicing, Fermentation, Modified atmosphere packaging, Pasteurisation, Smoking, Pulse electric fields technology, Cold plasma treatment, High pressure processing.

References: 168,169,170,171,172

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 4,CO 8	Differentiate between classical and contemporary food processing techniques and support the current and emerging trends in the Ayurvedic food industry.	2	Lecture	CAN	Knows-how	L_VC,BS ,ML,C_L
CO 8	Demonstrate various food processing techniques used in current Ayurvedic food Industries	4	Practical Training 13.5	PSY-GUD	Shows-how	RLE,DIS, FV,IBL
CO 1,CO 5,CO 6,CO 8	Analyze Functional Food and Modified Food Formulations in Ayurvedic Food Industry.	4	Experiential-Learning 13.5	PSY-ADT	Shows-how	PrBL,BS, D,DL,PE R

Practical Training Activity

Practical Training 13.1 : Formulations from Classics prepared with aahara Dravya

The teacher will instruct each student to refer the classical texts for ingredients and proportions of all the formulations listed here. The students will prepare any 4 selected formulations following SOP. under the guidance of teacher.

- 1) Toya varga- Shadaga Paniya, Ushnodaka
- 2) Kshira varga- Shunthi Kshirapaka, Takrarishta, Tila navaneeta yoga, Panchagavya ghruta
- 3) Ikshu varga- Sharkara kalpana, Guda chatushtaya gutika
- 4) Madhu varga- Madhvasava, Madhu shukta
- 5) Taila Varga- masha Saindhava Taila, hingwadya Taila
- 6) Madya Varga - Yava Sura, Mardika, Varuni

Practical Training 13.2 : Demonstration of therapeutic diet formulations

The teacher will instruct the students to refer the classical texts and explore disease specific diet formulations, understand their classical description and specific therapeutic utility. The students will prepare any 4 formulations following SOP under the supervision of the teacher. They may select the formulations from the list mentioned below or any other formulations as instructed by the teacher.

- 1) Jvara- - (Charaka Chi. 3/ 178 to 196)
- 2) Rakta pitta Tarpana- (Cha. Chi 4/33-39)
- 3) Aushadhi Siddha Yavagu - (Cha. Su. 2- summarize all 28 Yavagu) Prepare Gavedhuka Yavagu if material is available.
- 4) Amavata- Sapta mushtika Yusha- (Sharangadhara Ma. Kh. 2/164)
- 5) Chhardi - Draksha/ Kapittha Panaka (Ch.chi 20/36)
- 6) Atisara- Appraise formulations of Yavagu, Vilepi, Khada, Yusha, Rasaudana and their administration in different clinical conditions of atisara.(Ch.chi 19/23-41)

Practical Training 13.3 : Demonstrate Protocol for the selected Aahara Kalpana-

Each student will Demonstrate/ Observe/ Assist/Perform any 16 formulations (one from each type) with their peers and taste the final product to assess the palatability.

1. Manda- Ashtaguna Manda(Sha. Sam. Ma. Kha. 2/171,172)
2. Peya- Kasaghna Peya(Cha. Chi.18/79,80)
3. Vilepi- (Su. Su.46/342-344)
4. Yavagu-Kwathasiddha/KalkaSiddha- Yavakoladi Yavagu(Su.Ch.5/18) Pramehaghna Yavagu(Su.Chi.11/9)

5. Yusha- Kruta/Akruta- Mudga Yusha(Su. U. 39/137,Su. Su. 46/ 366) Mulaka Yusha(Su.Su.46/371, 372)
6. Odana-Gudaudana(Su.U.53/12),Pishitaudana(Su. U.43/20)
7. Krushara-(Su.Chi 25/35)
8. Mantha- Panchasara Mantha(Ash. Hr. chi.2/15) Trushnahara Mantha(Ash. Hr. chi.6/75)
9. Saktu- Yavasaktu(Ash.Hr.chi.12/14,15) Lajsaktu(Su.U.49/32)
10. Tarpana- Kamalbija Tarpana(Ash. Sam. U.2/80) Lajatarpana(Ch.Chi 4/35)
11. Panaka/ Sharkara- draksha Panaka (Ch.Su.27/279) Pathyakar Panaka(Ash. Sam. chi.6/32)
12. Khada/ Khala- (Ash. Sam. chi.10/38-39)(Ash. Sam. chi.11/8) (Su.U.42/55)
13. Kambalika- (Su.Su.46/376)
14. Takra- Yavanyadi Takra(Ch.Ch.13/103)
15. Mamsarasa- (Ch.chi8/67) Eladi Mamsarasa(Su.U.47/42)
16. Modaka- Prinana Modaka(Ash.Hr. U.1/39,40) Bilvadi Modaka(Ash. Hr. u. 1/40)

Practical Training 13.4 : Demonstration of the preparation of novel Ayurvedic food products

The teacher will demonstrate selected novel Ayurvedic food products such as biscuits/cookies, candy/chocolate and granules and explain the SOP. The students will observe the procedure and prepare the same under the direct observation and guidance of the teacher. Based on the ingredients the students will calculate the nutritional values of the products prepared

Practical Training 13.5 : Demonstration of food processing techniques used in current Ayurvedic food Industries

The department will arrange a visit to the nearest food industry after getting prior permission. The students will observe the food processing technology, quality check, packaging etc. They will critically assess the potential effects of processing techniques on food quality.

OR

A visit will be arranged to the Ayurvedic pharmaceutical unit that prepares nutraceutical products, where the students will learn the entire process of manufacture, quality check, packaging etc.

OR.

Visit Ayurvedic food manufacturing units, ensuring that at least one is GMP-certified and FSSAI-approved, and observe various food processing

OR

A video demonstration of a food processing unit including various techniques, machinery, QC methods, packaging, research etc.

The students will observe the video, record their findings, present them, and discuss.

The students will visit the factory where freeze drying and vacuum drying, and other drying technologies are used, and understand the technique or a video demonstration of the same may be arranged.

Students will review ready-to-cook (RTC) and ready-to-drink (RTD) Ayurvedic foods in the market.

Experiential learning Activity

Experiential-Learning 13.1 : Critical appraisal of unique formulations prepared from Aahara dravya

The teacher will instruct students to study the Ahara Varga from classical texts in depth, accompanied by commentary, for better understanding. Each student will search the formulations from the E-samhita portal or manually from the printed Samhitas. Each student will prepare any 4 (one from each group mentioned below) selected formulations following SOP.

- 1) Shuka dhanya varga- Vatya manda, Tandulodaka
- 2) Shimbi Dhanya Varga- Masura Ghruta, Mudgadi Ghruta (Yogaratnakara Striroga)
- 3) Mamsa Varga- Mayura Ghruta(Ch. chi 26/156-158)Tittiri Putapaka(Sushruta. Uttara 40/84,85), Mushika taila (Sushruta/ Kshudraroga/ Gudabhramsha chikitsa (Su.chi.20/61-63)Pishita odana(Su. U.43/20)
- 4) Shaka Varga- Patoladi Ghruta, Surana Vataka, Mulaka Taila, Kushmandavaleha
- 5) Pushpa varga- Shriphala kusuma vati, Lavangarishta(Gada-nigraha) , Palash Pushpasava.
- 6) Phala Varga- Dadimavaleha, Draksharishta, Kharjuradi Mantha, Bilvavaleha, Kapitthashtaka Churna.
- 7) Lavana Varga- Hingu sauvarchala ghruta, Vallabha Ghruta(Yogaratnakara, Hrudroga) Bhaskar Lavana Churna.
- 8) Spices- Pancha kola Phanta, Eladi Gutti, Hingvashtaka Churna, Haridra Khanda, Jirakarishtha

Experiential-Learning 13.2 : Disease specific Ayurvedic Ahara

Faculty will convey to the students the plan of the study as follows-

1. Select three Adhyayas from Charaka Samhita Chikitsa Sthana and three Adhyayas from Sushruta Samhita Uttarsthana.
2. Distinguish and list the Aahara dravyas (food substances) and dosage forms used to treat the specified diseases.
3. Interpret the rationale behind the combinations of the ingredients used in these treatments.
4. Explain the correlation between the stages of the disease (Rogavastha) and the recommended therapeutic diet.
5. Appraise the classical descriptions of the vyadhi-pratyanika (disease-specific) and Lakshana-pratyanika (symptom-specific) therapeutic diet recommendations.
6. Demonstrate any four preparations from your compilation of dietary yogas based on the Charaka and Sushruta Samhita.

OR

The teacher will instruct the students to visit the hospital and review the prescribed diet for the diseases the students have studied. The students will note down the dietary formulations and present their findings with the method of preparation and rationality of prescription.

Experiential-Learning 13.3 : Personalised prescription for Aushadhi Siddha Ahara.

The teacher will instruct the students to refer Ayurveda Ahara compendium and search for relevant articles and study them thoroughly. The students will present their findings, discuss with peers and create list of the formulations. A departmental seminar will be organized to present the categorized data. The students will be instructed to consult with the relevant authorities in the hospital, focus on preparing, prescribing, and administering pathya aahara for IPD patients, especially about Samsarjana krama after Panchakarma. The students will be instructed to identify at least 10 classical formulations as a result of these activities.

Experiential-Learning 13.4 : Exploratory Survey about the Ayurvedic Food Industry and Ayurvedic Food products available in the market.

The teacher will instruct the students to conduct a market survey following the suitable format and SOP. The students will follow the structured method including the defining of objectives, identifying target audience, designing the survey method, validation of questionnaire, pilot test, distribution of survey and data collection. The students will explore the market and collect the data regarding the food products available in the market. Collected data will be presented. The data will be analysed, discussed and the conclusion is drawn with the help of inputs given by the teacher.

Experiential-Learning 13.5 : Analysis of Functional Food and Modified Food Formulations in Ayurvedic Food Industry.

The teacher will instruct the students to explore Eight categories of Functional foods, A departmental seminar will be planned and a debate on the topic Ayurvedic nutraceuticals will be organised.

Each student will be allotted a different classical product having nutraceutical value such as Shatavari Ghrita, Draksha Avaleha, Bhrahma Rasayana, Narilela Khanda, Narsimha Rasayana etc. The students will prepare the allotted product following SOP, present their observations and discuss the nutritional values of the prepared product.

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. Departmental Seminar where each student will present the paper on the given topic and discuss- 50 marks Departmental seminar will be arranged, and review papers will be presented by each student on the given topics based on the contents of this Module.	4

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Module 14 : Ayurvedic Formulations for Holistic Wellbeing, Vitality and Body Care

Module Learning Objectives

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

- 1) Describe the formulations used for the maintenance/ promotion of health
- 2) Appraise the role of Rasayana formulations in the prevention of diseases as well as in the promotion of wellness
- 3) Demonstrate classical unique formulations of Rasayanas
- 4) Demonstrate pharmaceutical preparation of body care health products.

M 14 Unit 1 Rasayana-Personalized Rejuvenation Formulations

1.1 Key aspects of Rasayana Formulations
1.2 General Rasayana and Organ-specific/Target-specific Rasayana- Varnya, Tvachya, Kanthya, Swarya, Keshya, Hrudya, Medhya- Formulations

References: 173,174,175,176,177,178,179

3A	3B	3C	3D	3E	3F	3G
CO 6	Describe the mode of action of Rasayana Formulations.	2	Lecture	CC	Knows-how	IBL,DIS, L&PPT
CO 6	Describe classical Rasayana and Vajikarana Formulations	2	Lecture	CC	Knows-how	BS,L&PPT ,IBL
CO 6	Demonstrate the preparation method of Rasayana Drugs following validated SOP	8	Practical Training 14.1	PSY-MEC	Shows-how	D

CO 6	Demonstrate the role of Ayurvedic Rasayana formulations in the maintenance of health and Vajikarana Formulations for better progeny(Suprajanana)	5	Experiential-Learning 14.1	PSY-GUD	Shows-how	BS,CBL,LS,ML,DIS
CO 6	Select appropriate Ayurvedic Formulations for the fitness of specific body parts and analyze their role in the maintenance of health	7	Experiential-Learning 14.2	PSY-GUD	Shows-how	JC,PrBL,DIS,ML

M 14 Unit 2 Ayurvedic based cosmetic preparation 2.1 Body/ Hair/ Lip/ Oral/Skin/ Foot care products- Preparation methods and application in Ayurvedic cosmeceuticals

2.2 Preparation process of Lip balm, lipsticks, shampoos, cold cream and vanishing cream, toothpaste, hair dyes, Sunscreen lotion, Face pack, Mask, Toners, herbal soaps, Body wash etc.

2.3 Current and Emerging trends – Ayurveda, Ayurvedic footwear, Eye mask

References: 180,181,182,183,184,185,186

3A	3B	3C	3D	3E	3F	3G
CO 6,CO 8	Discuss the role of Ayurvedic formulations in Cosmetic preparations	3	Lecture	CC	Knows-how	EDU,SDL,RP,PAL
CO 6,CO 8	Evaluate the Global need for body care products in the healthcare sector	3	Lecture	CE	Knows-how	SDL,L&GD,CBL
CO 6,CO 8	Demonstrate preparation of Herbal Cosmetics	6	Practical Training 14.2	PSY-MEC	Shows-how	D,ML,DL
CO 6,CO 8	Demonstrate the preparation of Modified Cosmeceuticals	6	Practical Training 14.3	PSY-GUD	Shows-how	RLE,D,DL,PrBL
CO 5,CO 8	Analyze different cosmetics available in the market	7	Experiential-Learning 14.3	PSY-GUD	Shows-how	FV,TPW

CO 1,CO 2,CO 8	Design and prepare novel Ayurvedic cosmeceuticals.	7	Experiential-Learning 14.4	PSY-GUD	Shows-how	RLE,PrBL
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Practical Training Activity

Practical Training 14.1 : Demonstration of Rasayana Formulations.

Each student will prepare a selected Rasayana product under the supervision of the teacher, following the SOP. The teacher will allot any of the following products or any other Rasayana formulation.

- Chyavanprash
- Chaturvidha Triphala Rasayana
- Vrushya payasa yoga
- Apatyakara Ghruta
- Every year Faculty can allot different formulations selected from the classical texts.

Practical Training 14.2 : Demonstration of Body care products.

The teacher will demonstrate the preparation of a selected herbal-based body care product following Standard Operating Procedures.

- Hair Care: Shampoo, Hair conditioner, Hair oil for hair fall/ greying of hair/ Hair dye/ Hair colorant
- Body Care: Soap/Perfume/ Roma Shatana yoga(Depilator), bath/ Shower products
- Face Care: Face pack / Talcum Powder, Herbal face mask
- Lip Care: Lip Balm, Lipstick
- Oral Care: Toothpaste/Mouthwash
- Foot Care: Cream
- Hand Disinfectant: Hand Sanitizer

- Skin Care: Moisturizer/Sunscreen Lotion
- Eye care: Kajal- eyeliner

After observing the procedure, each student will prepare a body care product from each category under the supervision of the teacher

Practical Training 14.3 : Demonstration of the preparation of Modified Cosmeceuticals

The teacher will ask each student will search e-resources to assess the expectations of end users from the herbal cosmetics Industry. Based on the information collected, each student will design at least one their own innovative modified Cosmeceutical formulation under the guidance of the teacher developing an SOP. The students will note down the challenges faced, corrective actions done during the preparation, present their findings and discuss

Experiential learning Activity

Experiential-Learning 14.1 : Role of Ayurvedic Rasayana Vajikarana Formulations

The students will compile classical formulations having Rasayana and Vajikarana action, classify them based on various criteria, Viz. Dhatu Karya, Avayava Karya, Vyadhi kshamatva Vardhana etc. They will present their findings in front of the peers. The contents of presentation should include, the rationality behind the selection and combination of Ingredients and the proportion of ingredients in the selected formulation, justification of the role of Rasayana based various mechanisms of action and the role of Vajikarana formulations in Suprajanana. The students will refer relevant research articles published in peer reviewed journals

Experiential-Learning 14.2 : Role of Ayurvedic Formulations in the wellness of specific body parts

The teacher will allot each student with different target specific Rasayana Dravya such as, Hridya, Varnya, Tvachya etc. Each student will explore the principle of designing classical Formulations and their specific target and compile a list of formulations having a specific target action. The faculty will distribute 2 formulations to each student from the following list(or any relevant formulations)

1. Varnya - Kunkumadi Taila, Kanaka Taila(Charaka samhita)
2. Tvachya- Eladi taila, Chandan bala Lakshadi taila, Nalpamaradi taila (sahasrayoga)
3. Kanthya- Khadiradi Vati, Kanthasudharaka vati
4. Keshya - Bhrungaraja Taila
5. Hrudya- Prabhakara Vati
6. Medhya- Brahmi Vati

Experiential-Learning 14.3 : Market survey for Ayurvedic Body care products.

Students will be instructed to conduct a market survey and collect information about the maximum number of Ayurvedic cosmetics available in the market. Students will also search for information about, Ayurveda (Review Manjishtha and Sphatika for Vastraranjana property), Ayurvedic footwear, Eye masks available in the market. The students will present the collected data in the classroom and discuss.

Experiential-Learning 14.4 : Designing and preparing novel Ayurvedic Cosmeceuticals.

The teacher will allot each student a different cosmeceutical product. The students will design the formulation, selecting the relevant ingredients and proportions. They will prepare the product following the Standard Operating Procedure. The students will present the product and discuss their experience along with the challenges faced by them. The teacher will check the product, give the feedback

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. A) Practical Examination- 25 Marks Preparation of any one Rasayana or Vajikarana Formulation and questions asked on that. OR Preparation of any 2 body care products and questions asked on that. and B) Any experiential learning method in converted form can be taken for assessment (25 marks) or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential as portfolio/reflections/presentations, can be taken as an assessment. (25 Marks)	4

Semester No : 6

Module 15 : Disease condition specific selection of formulation

Module Learning Objectives

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

- 1) Present a list of Kalpa & Kalpana used in all clinical departments.
- 2) Develop a checklist of assessment parameters of finished drugs to be supplied for the respective departments
- 3) Identify and investigate drug and dosage form selection principles based on Roga and Rogavastha

M 15 Unit 1 Application of Yukti Pramana in Formulation Selection1.1 Disease Category and Determination of multiple factors involved in diagnosis and treatment

1.2 Strategic selection of drugs and dosage forms

1.3 Stage-specific selection (Rogavastha and Bhaishajya Kalpana)

References: 48,53,56,59,90,98,100,102,104,106,107,109,176,237,238,239,240,241,243

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 6	Appraise the rational relationship between Roga and Bhaishajya Kalpana based on classical references	1	Lecture	CAN	Knows-how	L&GD,L &PPT
CO 1,CO 2,CO 6	Analyse and justify the selection of formulation according to the Rogavastha (stage of disease)	1	Lecture	CAN	Knows-how	IBL,BS,L &GD,DIS

M 15 Unit 2 Selection of formulations for Speciality practice in Ayurveda2.1 Speciality practice in Ayurveda

2.2 Alignment of formulations with the specialty branch of clinical Practice

2.3 Drugs with ideal guna, virya, vipaka, and of appropriate dosage forms for the patient and pathology

2.4 Evidence-based drugs and dosage form selection for specialty practice.

References: 55,56,59,65,71,73,74,78,100,102,104

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 6	Describe different branches /specialty practices in Ayurveda and justify the need for specific dosage forms for effective clinical outcomes	2	Lecture	CAN	Knows-how	L,LS,L&GD,TUT
CO 1,CO 2,CO 6	Demonstrate the essential formulations needed for the diverse branches of Ayurveda.	5	Practical Training 15.1	PSY-GUD	Shows-how	D,PrBL,IBL,TPW,PL
CO 1,CO 2,CO 6	Identify different dosage forms used by local health practitioners. through filed based survey.	5	Practical Training 15.2	PSY-GUD	Shows-how	RLE

M 15 Unit 3 Routes of Drug Administration 3.1 Classical and conventional concepts of Drug Administration.

3.2 Routes of Drug Administration – Need and Relevance

3.3 Factors in the selection of drug and dosage form based on route of administration

3.4 Matching Dosage Forms to Pharmacological Needs by Selected Route

3.5 Properties of formulations and their effect on Pharmacodynamics

References: 190,191,192,193

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Analyze the formulations and routes of drug administration, and justify the relevance of each route in pharmacology.	2	Lecture	CAN	Knows-how	BS,DIS,JC
CO 1,CO 2,CO 6,CO 8	Analyze the key characteristics of dosage forms that meet the needs of various routes of drug administration	10	Experiential-Learning 15.1	PSY-MEC	Shows-how	BS,IBL,BL,PL,JC

M 15 Unit 4 Designing formulations for Shodhana and Shamana Chikitsa4.1 Ideal characteristics of drugs as per classics (Matravat Bhesaja lakshanani)

4.2 Principles of Shodhana chikitsa (Purificatory/detoxifying therapy) and actions of formulations used for shodhana - Langhana, Doshanirhana, srotahshodhana
 4.3 Principles of Shamana chikitsa (palliative treatment) and actions of formulations used for Shamana- Deepana, Pachana, Stambhana, Rasayana, etc.
 4.4 Evidence-based dosage forms and formulations for common diseases

References: 90,237,238,239,240,241,243,244

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Compare dosage forms and formulations used for shodhana and shamana chikitsa	2	Lecture	CAN	Knows-how	L&PPT ,J C,IBL,BS ,PBL
CO 1,CO 2,CO 6	Demonstrate the method of preparation of frequently used formulation for Shodhana and Shamana Chikitsa of common diseases	10	Practical Training 15.3	PSY-GUD	Shows-how	D,RLE,T PW

M 15 Unit 5 Innovation in Ayurvedic Formulations
 5.1 Need and current trends in the industry of Ayurvedic Pharmaceutics
 5.2 Innovative Formulations-Transdermal patches, Nebulizers, Eye masks, etc.
 5.3 Relevance and consequences of innovation done by the R&D department of Ayurvedic Pharmacies
 5.4 Knowledge, Attitude, and Practice (KAP) studies on various aspects related to Ayurvedic Formulations available in the market

References: 74,84,148,155,158,159,160,161,184,187,188

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 8	Discuss challenges associated with recent modifications and innovations in Ayurvedic formulations, specifically focusing on transdermal patches and nebulizers.	2	Lecture	CC	Knows-how	L&PPT , L&GD,L _VC
CO 1,CO 2,CO 6,CO 8	Demonstrate the method of innovative formulations that enhance well-being and redefine healthcare.	10	Experiential-Learning 15.2	PSY-GUD	Shows-how	TPW,DIS ,D,BS,Pr BL
CO 5,CO 8	Demonstrate the essential competencies needed to develop R&D department of	6	Experiential-	PSY-	Shows-	FV,RLE,

	Ayurvedic Pharmacy.		Learning 15.3	GUD	how	W
Practical Training Activity						
Practical Training 15.1 : Demonstration of formulations used in various branches of Ayurveda.						
Each student will prepare at least one formulation from each group under the direct observation of the teacher: 1. Kaumarbhrtiya- Balachaturbhadra Rasa, Preenana modaka 2. Striroga- Pushyanuga Churna, PhalaGhruta 3. Garbhini- Garbhpal Rasa, Formulations from Masanumasiki Garbhini paricharya 4. Sutika- Bala taila, stanyashodhana Yusha 5. Shalyatantra- Kshara Sutra, Vranashodhan Taila, Murivenna 6. Shalakya Tantra- Bilwa taila / Irimedadi taila / Chandrodaya Varti 7. Kayachikitsa- Yavani shadava Churna, Vasaghruta 8. Panchakarma- Niruha Basti Samyojana, Pradhama Nasya Yogas, Ghreya Virechana Yoga 9. Rasayana-Bhallataka Taila, Medhya Vachayoga 10. Vajikarana- Vrishya Payasa Yoga, Shatavari Ghruta The teacher will explain and discuss the unique combination of ingredients, their proportions, SOP, endpoint, Matra, Anupana, and time for administration, probable mode of action, therapeutic efficacy, and relevant research articles						
Practical Training 15.2 : Survey the different dosage forms used by local health practitioners.						
The teacher will instruct each student to survey local Ayurvedic practitioners and collect information about the different dosage forms used by them. A standard survey format will be prepared by the teacher, and the student will fill. Each student may be given a different dosage form or a different area to conduct a survey study. The outcome of the survey will be analysed and presented.						
Practical Training 15.3 : Demonstration of frequently used formulation for Shodhana and Shamana Chikitsa of common diseases.						

Faculty will instruct the students to visit the Kayachikitsa and Panchakarma OPD and IPD of the hospital and observe the prescriptions for common diseases. Each student will list out a minimum of five classical formulations, and study them from that list for Classical reference, Ingredients, proportion, method of preparation, Matra, time, duration for administration and Anupana, Out of the selected five formulations, they will prepare at least three formulations under the direct observation of the teacher.

Experiential learning Activity

Experiential-Learning 15.1 : Understanding the routes of drug administration is crucial, as it highlights the importance of well-designed dosage forms that improve patient outcomes and therapeutic effectiveness.

The teacher will instruct each student to conduct the following UG curriculum teaching class and revise knowledge about the route of drug administration. They will discuss the advantages and disadvantages of each aushadhi prayoga marga and probable mode of action after administration of the following dosage forms-

1. Mukha (Oral Cavity): Vati, Gutika, Churna, Asava, Arishta, Kashaya, Avaleha, Khanda, Sneha (Ghrita/Taila),
2. Nasa(Nasal Route)- Dosage form used: Churna, taila, swarasa, arka
3. Karna (Through Ear)- Taila, Ghrita
4. Akshi (Through Eyes) - Ghrita, Taila,
5. Twak (Through Skin)- Lepa, Alepa, Pralepa, Malahara, upanaha, pradeha, abhyanga, udvartana
 - Shirodhara - Takra
 - Abhyanga- Sahacharadi Taila
 - Asthti Bhagna- Murivenna Taila
 - Vrana- Jatyadi Taila
 - Smashru – Shankha Bhasma
 - Kesha Ghanata- Bringaraja Taila
 - Akala Palita – Hasthi Danta Masi
 - Indralupta – Icchabhedi Rasa
 - Lomashatana – Lomashatana Lepa
6. Guda (Anal Route)- Dosage forms - Vartis, taila, ghrita, kalka, churna, kashaya
7. Mutra marga (Through urethra)- Uttara Basti with dosage forms- Taila, ghrita
8. Yoni marga (Through vagina)- Yoni Dharana, Yoni Dhavana, Yoni Pichu, Yoni Dhoopana

Each student will prepare a suitable dosage form from the list mentioned below, present their findings, and discuss:

1. Nasya Kalpana- Navana, Avapidaka, Dhuma, Pratimarsha, Pradhamana
2. Mukha Kalpana- Kavala, Gandusha, Patisaran, manjan
3. Basti kalpana- Yapana, Anuvasana, Karshana, Sneha, Bruhana, Vajikara, Rasayana, Matra
4. Netra Kalpana- Seka, Aschyotana, Pinda, Bidaal, Tarpana, putapaka,
5. Nabhipurana- Bindu Taila (Sha. Sam. Ma. Kh. 9/61-66)
6. Other bahya Kalpana- Lepa, Dhara, Bandha, Dhupana, Agnikarma, Kshara karma, Avagaha, Pinda, Drava sveda, Taap sveda, Vrana karma, jalauka, Paadabhyanga

Evaluate the role and responsibility of effective dosage form design for the aforementioned Ayurvedic treatment modalities. Refer to relevant articles to enhance your understanding and organize a departmental presentation on this topic.

Experiential-Learning 15.2 : Hands-on training focusing on innovative formulations

The faculty will instruct each student to prepare different innovative formulations such as transdermal patches, nebulizers, and eye masks. They will discuss the necessity and current trends in innovative formulations within the field of Ayurvedic pharmaceuticals, review modern pharmaceutical literature, consult experts, or watch videos to understand the SOP for transdermal patches, nebulizers, eyemasks, and other innovative formulations. Each student will prepare the allotted innovative product, present the observations, and discuss the challenges faced

Experiential-Learning 15.3 : Learning about the R&D department of Ayurvedic Pharmacy.

The students will be posted to the nearby R&D unit. The students will collect information about the working culture of the R&D unit, evaluate the essential competencies needed to excel in the R&D department of Ayurvedic Pharmacy. They will summarize their observations and present their findings along with the global status of Ayurvedic Pharmaceutical products..

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. A) PowerPoint presentation- 25 marks Each student will prepare a PowerPoint presentation on any one topic and present to the department. Topics- 1) Routes of drug administration 2) Application of Yukti Pramana in formulation selection 3) Drug and dosage form selection for speciality practice 4) Matravat Bhesaja Lakshanani 5) Actions (Karma) of formulations used for Shodhana and Shamana 6) Need and current trends in the Ayurvedic Pharmaceuticals industry. 7) Innovation in Ayurvedic formulations. B) Practical Examination- 25 Marks Preparation of any one Vamana Formulation or Virechana Formulation, and questions asked on that or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential as portfolio/reflections/presentations, can be taken as an assessment. (25 Marks)	4
Module 16 : Current trends in Ayurvedic Pharmaceutical Industry.	
Module Learning Objectives (At the end of the module, the students should be able to) 1) Describe the global demands and commercial manufacturing of Ayurveda drugs. 2) Evaluate the methods adopted by the industries in commercial Ayurveda drug manufacturing 3) Discuss the functionality of various sections of a GMP-approved Ayurvedic Pharmacy. 4) Identify career opportunities and competencies required for the same	

M 16 Unit 1 Key Competencies Required for Employment in Pharmacy
 1.1 Orientation about current trends in the Ayurvedic Pharmaceutical Industry
 1.2 Ayurvedic Pharmacy Industry (India & Global Overview): Market size, growth, and key importing countries
 1.3 Ayurvedic Products and Market Stakeholders
 1.4 Consumer Preferences and Distribution Channels

References: 192,193,196,406,407,408

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 7	Discuss current trends in Ayurvedic pharma industry	1	Lecture	CC	Know	DIS,L&P PT
CO 7,CO 8	Discuss key competencies required for employment in the Ayurvedic pharmacy	1	Lecture	CC	Knows- how	DIS,BS,I BL,RLE, SDL
CO 8	Describe career opportunities in Ayurvedic pharma industries	1	Lecture	CC	Knows- how	PrBL,RL E,DIS
CO 5,CO 7,CO 8	Discuss key competencies required for employment in the Ayurvedic pharmacy	1	Lecture	CC	Knows- how	DIS,BS,B L,CBL
CO 7,CO 8	Analyze the Market Status of Ayurvedic Pharmacy Industry	8	Practical Training 16.1	PSY- GUD	Shows- how	DIS,PrBL ,RLE,SD L,IBL
CO 8	Assess real-life experience of the market for the growing popularity of Ayurvedic products.	10	Experiential- Learning 16. 1	PSY- MEC	Does	FV,BS,C_ L,BL,DIS

M 16 Unit 2 Internship/ Visits to GMP certified Pharmacies
 2.1 Factory set up and daily Work flow
 2.2 Hygiene checks & Cleaning
 2.3 Inventory Management, material management and Production

2.4 Packaging and labelling

2.5 Documentation (batch records) and QC record

References: 194,195,196

3A	3B	3C	3D	3E	3F	3G
CO 7,CO 8	Describe the sections and working flow of GMP-certified pharmacy	2	Lecture	CC	Knows-how	FV,SDL,I BL
CO 7,CO 8	Observe and appraise the operational management of Ayurvedic Pharmacy	6	Practical Training 16.2	AFT-VAL	Knows-how	DIS,FV,R LE
CO 7,CO 8	Interpret benefits of field visit and Internship	8	Experiential-Learning 16.2	AFT-SET	Shows-how	FV

M 16 Unit 3 Quality Assurance and Quality Control (QAQC) Laboratory Training3.1 Information about Leading Ayurvedic Research Labs in India

3.2 Regulatory & Certification Bodies for QAQC of Ayurvedic Formulations

3.3 Laboratory set up and daily Work flow

3.4 LIMS (Laboratory Information Management System).

3.5 Instrument Calibration, Sample testing and analysis, Record keeping.

References: 197,198,199

3A	3B	3C	3D	3E	3F	3G
CO 3,CO 4	Describe modern parameters used for quality assurance and quality control of Ayurvedic Drugs	4	Lecture	CAP	Knows-how	LRI,DA,L _VC
CO 3,CO 4	Demonstrate and assist quality control practical to display quality standards of Ayurvedic formulations	6	Practical Training 16.3	PSY-GUD	Shows-how	LRI,DL,D A
CO 3,CO 4,CO 8	Justify the utility of LIMS(Laboratory Information Management System) in Ayurvedic research laboratories and the workflow of the laboratory.	8	Experiential-Learning 16.	AFT-VAL	Shows-how	IBL,RLE, ML,FV,C

		3		_L
Practical Training Activity				
Practical Training 16.1 : Market Status of Ayurvedic Pharmacy Industry				
• Students will- Conduct surveys, interviews, and focus groups with consumers, retailers, manufacturers, and healthcare professionals. • Resources Utilize market reports, industry publications, and academic research to gather data and insights.				
Practical Training 16.2 : Internship / Visits to GMP-certified Ayurvedic pharmacy Units(Minimum 5 units- Small/ Medium/ Large)				
The department will arrange a visit/training (internship) in a GMP-certified pharmacy. The students will observe the daily work patterns in all sections of the Pharmacy and get an on-hand training in various sections (based on the availability). They will also learn about inventory management and the documentation pattern of the Pharmacy. They will submit the report after the training session.				
Practical Training 16.3 : Perform any 5 QC practicals on formulation prepared by yourself.				
Faculty should demonstrate the following practical- A. Tablets • Uniformity in Weight and Size • Tablet Hardness B. Semisolid Dosage Forms • Moisture Content				

- Microbial Load
- C. Liquid Dosage Forms
- PH Value
 - Refractive Index
 - Specific Gravity
 - Saponification Value
 - Iodine Value
 - Acid Value
 - Viscosity etc.

Experiential learning Activity

Experiential-Learning 16.1 : Assessment of the real-life experience of the market for the growing popularity of Ayurvedic products.

The students will conduct a survey and identify the popular Ayurvedic products and major players in the market. Based on their observations, they will carry out a SWOT analysis. Each student will analyse different categories of formulation, present the findings and discuss

Experiential-Learning 16.2 : Internship in the Ayurvedic Pharmacy.

Each student should-

- Understand current trends in the field of Pharmaceutical Industry
- Identify career opportunities
- Survey for the availability of various types of formulations and Ayurvedic Pharmacies
- Information about Ayurvedic Pharmacies and various Relevant associations
- Inculcate the competencies required for a start-up as an entrepreneur in the field of production of Ayurvedic formulations

Experiential-Learning 16.3 : QAQC Laboratory Training

The students will visit the QAQC laboratory and observe and understand the working pattern of the Laboratory. The students will interact with the concerned experts and obtain updated information about Leading Drug research laboratories / CCRAS drug research units, regulatory and certification bodies for QAQC of Ayurvedic

Formulations. The students will be able to justify the need and importance of QAQC in the field of Ayurvedic Pharmaceutics. The students will also observe the Calibration of instruments used for analysis. They will prepare a report of their experience, present the same, and discuss.

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. A)Portfolio– 50 marks Each student will prepare a portfolio based on the observation and training acquired through field visits to pharmacies and Research laboratories. and B)Any practical in converted form can be taken for assessment. (25 Marks) or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolio/reflections/presentations, can be taken as an assessment. (25 Marks)	4

Paper No : 3 Standardization and clinical Utility of Ayurvedic formulations						
Semester No : 3						
Module 17 : Guidelines for administration of Rasoushadhi in clinical Practice						
Module Learning Objectives (At the end of the module, the students should be able to) 1. Discuss the concept of Rasa Chikitsa and explain the clinical superiority of Rasoushadhi. 2. Illustrate the concept, need, and procedure of Kshetrikarana and its significance in the safe administration of Rasoushadhi. 3. Discuss appropriate Pathya apathya during Rasa Yoga Sevana. 4. Elaborate on the toxicological profile of Rasoushadhi, including Ashuddha, Apakwa Bhasma Sevana Janya Dosha, and its management with safe prescription trends of Rasoushadhi. 5. Discuss heavy metal toxicity and its management with chelation therapy.						
M 17 Unit 1 Concept of Rasa chikitsa and significance of Rasoushadhi 1.1. Perspectives on the Notion of Rasa 1.2 Significance of Rasa Chikitsa 1.3. Various treatment modalities of Ayurveda References: 52,61,93,94,95,96,97,98,99,101,102,103,104,105,108,109,110,200,201,202,203,242,243						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Analyse the term Rasa from the Sanskrit and Ayurvedic literatures and discuss the significance of Rasoushadhi	1	Lecture	CC	Knows-how	L&PPT ,L

CO 1,CO 2,CO 7	Discuss various treatment modalities used in the Ayurvedic system of medicine	1	Lecture	CAP	Knows-how	L&PPT , DIS,CBL, L&GD
CO 1,CO 6	Demonstrate the rational prescription for a selected disease	3	Practical Training 17.1	PSY-GUD	Shows-how	D,DIS,CBL,D-BED
CO 1,CO 2	Apply the principles of Rasa Chikitsa in the clinical practice/ allotted case.	6	Experiential-Learning 17.1	PSY-GUD	Shows-how	CBL,PrBL,FV,DIS

M 17 Unit 2 Concept of Kshetrikarana and its significance prior to administration of Rasoushadhi
2.1.Etymology and Concept of Kshetrikarana.
2.2. Kshetrikarana for Optimising Medicine Efficacy
2.3.Procedure of Kshetrikarana (Panchakarma & Pancha Shodhana)

References: 93,94,95,96,97,98,99,101,103,104,204,205

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Define kshetrikarana and discuss the concept of kshetrikarana	1	Lecture	CC	Knows-how	L&PPT
CO 1,CO 6	Discuss the need and benefits of Kshetrikarana	1	Lecture	CAP	Knows-how	L&PPT ,BS,CBL
CO 1,CO 2,CO 6	Demonstrate the need and role of Kshetrikarana	3	Practical Training 17.2	PSY-GUD	Shows-how	CBL,D,DIS,L&GD
CO 1,CO 2,CO 6	Demonstrate the procedure and benefits of kshetrikarana	6	Experiential-Learning 17.2	PSY-GUD	Shows-how	DIS,CBL,CD

M 17 Unit 3 Pathya -Apathya during Rasayoga Sevana
3.1.Pathya and Apathya Ahara, Vihara, and Manasika Vikara during Rasayoga Sevana
3.2.Importance of Pathya-Apathya during Rasayoga Sevana.

References: 58,59,61,65,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,109,110,113,206

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Define Pathya and Apathya ahara and describe its importance	1	Lecture	CC	Knows-how	DIS,L&G D,BS
CO 1,CO 2	Describe the application of the concept of what pathya and apathya vihara with respect to the Manasika vikara	1	Lecture	CAP	Knows-how	DIS,BL,L &GD
CO 1,CO 2,CO 6	Enlist and demonstrate common pathya and apathya Ahara during rasa yoga sevana	2	Practical Training 17.3	PSY-GUD	Shows-how	DIS,CBL, D
CO 1,CO 2,CO 6	Enlist and demonstrate the common pathya-apathya Vihara during rasa yoga sevana	2	Practical Training 17.4	PSY-GUD	Shows-how	D
CO 1,CO 2,CO 6	Generate document depicting the outcome of compliance and non-compliance with the pathya apathya guidelines	6	Experiential-Learning 17.3	PSY-MEC	Does	BS,CBL, DIS

M 17 Unit 4 Safety and toxicity of Rasoushadhi
 4.1.Safety considerations of Rasoushadhi
 4.2.Ashuddha and Apakwa Bhasma Sevana Janya Vikara and their management
 4.3.Safety and prescription trends of Rasoushadhi

References: 93,94,95,96,97,98,99,101,102,103,104,105,106,107,109,110,113,207

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss the safety considerations of Rasa oushadhies in detail	1	Lecture	CAP	Knows-how	L&GD,DIS,CBL
CO 1,CO 2,CO 6,CO 7	Analyse the consequences of Ashuddha or Apakwa Bhasma sevana Dosha, along with the treatment	1	Lecture	CAN	Knows-how	BS,DIS
CO 1,CO 2,CO 6,CO 7	Demonstrate a case study of signs and symptoms of rasa vikaras and their management	6	Practical Training 17.5	PSY-GUD	Shows-how	CBL,DIS, CD,D

CO 1,CO 2,CO 6	Assess and compare Ashuddha and Shuddha Bhasma effects in the clinical practice.	2	Practical Training 17.6	PSY-GUD	Shows-how	D,BS,CD, CBL
CO 1,CO 2,CO 6	Evaluate the prescription errors containing Rasoushadhis	4	Experiential-Learning 17.4	CE	Does	CBL,DIS

M 17 Unit 5 Heavy metal toxicity and chelation therapy5.1.The mechanism of heavy metal toxicity.

5.2.Symptoms of heavy metal toxicity.

5.3.Factors influencing heavy metal toxicity.

5.4.Concept of chelation therapy and risks, and benefits

References: 9,22

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Discuss in detail the sources, pathways, and factors influencing heavy metal toxicity	1	Lecture	CC	Knows-how	BS,L&PP T
CO 5,CO 7,CO 8	Discuss chelating agents and their role in managing heavy metal toxicity	1	Lecture	CC	Knows-how	DIS,L&P PT
CO 5,CO 7,CO 8	Demonstrate identification of heavy metal toxicity	2	Practical Training 17.7	PSY-GUD	Shows-how	CBL,DIS, D
CO 5,CO 7,CO 8	Evaluate the effect of your chelation therapy in the management of our heavy metal toxicity.	4	Experiential-Learning 17.5	PSY-MEC	Does	CBL,DIS, CD

Practical Training Activity

Practical Training 17.1 : Demonstration of the rational prescription for a selected disease

The teacher will create a case scenario of a clinical condition and demonstrate the clinical prescription of treatment modalities of Ayurveda, such as Shodhana, Shamana, Rasayana, and Vajikarana. Based on the demonstration, students will follow the same procedure in another disease, present the same, and discuss with a rationale.

Practical Training 17.2 : Demonstration of the need and role of Kshetrikarana
The teacher will demonstrate the identification of the patients requiring kshetrikarana and explain why kshetrikarana is required in that case; Students will observe and record the agni- dosha- dushya and readiness for the administration of rasaoushadhi in that case. Based on the demonstration, each student will be given a different case scenario. Students will analyse the case and explore the requirement of Kshetrikarana in that case and design the protocol of Kshetrikarana.
Practical Training 17.3 : Demonstration of common pathya and apathya Ahara during rasa yoga sevana
The teacher will provide a list of common Ayurvedic Pathya and Apathya Ahara based on classical guidelines. The teacher will assign each student a different list of Rasayoga. The students will prepare charts for the given rasa yogas and suggest appropriate pathya-apathya Ahara accordingly.
Practical Training 17.4 : Demonstration of the common pathya-apathya Vihara during rasa yoga sevana
The teacher will provide a list of common Ayurvedic Pathya and Apathya Vihara based on classical guidelines, such as sleep, daily regimen, seasonal modifications etc. The teacher will assign each student a different list of Rasayoga. The students will prepare charts for the given rasa yogas and suggest appropriate pathya- apathya Vihara accordingly
Practical Training 17.5 : Determination of signs and symptoms of rasa vikaras and their management
The teacher will demonstrate a case study of the patient experiencing side effects of Rasa Oushadhies. The students will identify and record the key signs and symptoms and analyse them. Accordingly, they will prepare at least one formulation for the management of the side effects.
Practical Training 17.6 : Comparative assessment of Ashuddha and Shuddha Bhasma effects
The teacher will create two sets of case scenarios, one with properly prepared Bhasma and the other with improperly prepared Bhasma. Students will present variations in clinical outcomes and adverse reactions.
Practical Training 17.7 : Identification of heavy metal toxicity
The teacher will give the clinical description of a case scenario with suspected heavy metal toxicity. The student will identify the heavy metal responsible for the toxic symptoms.
Experiential learning Activity
Experiential-Learning 17.1 : Exploring the Rasa Chikitsa through field visits.

The teacher will ask the students to explore the superiority of rasa chikitsa by conducting field visits to ayurvedic dispensaries and treatment centres, engaging with experienced ayurvedic practitioners. The students will record their findings, prepare the report, and submit.	
Experiential-Learning 17.2 : Exploring the procedure and benefits of kshetrikarana	
The teacher will instruct each student to visit Panchakarma unit to observe the process of Kshetrikarana. They will record their observations and present different steps of Kshetrikarana and discuss the benefits	
Experiential-Learning 17.3 : Outcome of compliance and non-compliance with the pathya apathya guidelines	
The students will observe case records of the patients undergoing Rasayoga sevana and document the benefits of compliance with prescribed Pathya-Apathya measures. Students will be assigned case studies where deviation from Pathya-Apathya resulted in suboptimal Rasayoga effect. Students will analyse the cases, identify key factors, and present how the patient outcome was influenced by non-adherence to Pathya-Apathya	
Experiential-Learning 17.4 : Evaluation of prescription errors containing Rasoushadhis	
The teacher will create sample prescriptions of Rasoushadhi with prescription errors. The students will analyse them for potential errors such as overdose, improper combinations, etc, and they will present their findings and discuss.	
Experiential-Learning 17.5 : Analysis of chelation therapy in heavy metal toxicity	
Students will present a case scenario of heavy metal toxicity with a description of clinical signs and symptoms, and suggest treatment strategies with suitable chelating agents. They will also explore classical methods of detoxification and compare them with contemporary chelation practices.	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various	4

assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

Any two of the following: 25X02

1. Class presentation
2. Structured Viva voce/Debate/Interaction
3. Case-based learning on the rational prescription of Rasouhadhi
- 4 . Structured LAQ

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Module 18 : Prayogika Bhaishajya Kalpana(Clinical application of Pharmaceutical products)

Module Learning Objectives

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

1. Critique the concept and significance of oushadha sevana kala concerning biological rhythms and chronotherapy.
2. Discuss the concept of anupana and its role in drug delivery, bioavailability, and reducing toxicity.
3. Analyse the concept of matra and factors affecting matra, including the calculation of paediatric dose.
4. Explore concepts and methodologies of drug repurposing.

M 18 Unit 1 Aushadha Sevana Kala (Time of administration of drug)

- 1.1 Classical concept of time of administration
- 1.2 Biological rhythms and chronobiology
- 1.3 Chrono-pharmaceutics and chronopharmaceutical drug delivery systems
- 1.4 Principles of chronopharmacology
- 1.5 Benefits of chronotherapeutics

References: 90,208,209,238,239,243

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss in detail the concept of Oushadha Sevana Kala in Ayurveda.	1	Lecture	CC	Knows-how	L&GD
CO 1,CO 6,CO 7,CO 8	Discuss biological rhythms and chronobiology and their significance in drug delivery	1	Lecture	CAP	Knows-how	L&PPT , L&GD,DIS
CO 2,CO 6,CO 7,CO 8	Elaborate the principles of chrono pharmaceutical drug delivery systems and their benefits.	1	Lecture	CC	Knows-how	BL,TBL, L&PPT
CO 1,CO 2,CO 6,CO 7	Demonstrate chrono therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics.	3	Practical Training 18.1	PSY-GUD	Shows-how	D,DIS,BS
CO 1,CO 6,CO 7,CO 8	Demonstrate Modulation of dosage form action by chronotherapeutic administration in Ayurveda	3	Practical Training 18.2	PSY-ADT	Does	DIS,D,CBL
CO 1,CO 2,CO 6,CO 7,CO 8	Demonstrate chrono therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics.	3	Experiential-Learning 18.1	PSY-GUD	Shows-how	CBL,BS
CO 1,CO 2,CO 6	Illustrate the modulation of the action of the dosage form by chronotherapeutic administration in Ayurveda.	3	Experiential-Learning 18.2	PSY-GUD	Shows-how	CBL

M 18 Unit 2 Concept and scientific basis of Anupana2.1 Classical concepts of Anupana in Ayurveda

2.2.Role of Anupana in bioavailability

2.3. Anupana for targeted drug delivery and distribution

2.4 Role of Anupana in the mitigation of adverse effects and toxicity

2.5 Anupana for synergistic effect

References: 90,104,210,211,237,238,239,240,241

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss in detail the concept of anupana in Ayurveda	1	Lecture	CAN	Knows-how	LS,L&PPT
CO 1,CO 2,CO 6	Explain the role of Anupana in bioavailability and targeted drug delivery.	1	Lecture	CE	Knows-how	L&PPT
CO 1,CO 2,CO 6	Demonstrate appropriate Anupana for the selected dosage form in different clinical conditions.	3	Practical Training 18.3	PSY-GUD	Shows-how	BS,DIS,CBL
CO 1,CO 2,CO 6,CO 7	Enlist appropriate Anupanas for various formulations in different clinical conditions.	3	Experiential-Learning 18.3	PSY-MEC	Shows-how	CBL,D,DIS
CO 1,CO 2,CO 6,CO 7	Demonstrate drug response through synergistic Anupana integration.	4	Experiential-Learning 18.4	AFT-VAL	Shows-how	BS,CBL
CO 1,CO 6,CO 7	Describe the role of Anupana in the modulation of drug tolerance and safety.	4	Experiential-Learning 18.5	PSY-MEC	Does	PrBL,CBL

M 18 Unit 3 Matra (Posology)3.1 Definition, importance, and clinical significance

3.2 Factors affecting drug dose

3.3 Posology according to modern pharmacology

3.4 Calculation of paediatric dose

References: 184,212,213,214,215,237,238,239,240,241,243,262

3A	3B	3C	3D	3E	3F	3G
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CO 1,CO 2,CO 6,CO 7	Elaborate on the concept, importance, and clinical significance of Matra.	1	Lecture	CC	Knows-how	BS,IBL,DIS,L&PPT
CO 1,CO 2,CO 6	Discuss the factors affecting drug dose in detail.	1	Lecture	CAP	Knows-how	L&PPT,DIS
CO 1,CO 2,CO 6,CO 7	Demonstrate the calculation of paediatric dose using different formulae.	3	Practical Training 18.4	PSY-GUD	Knows-how	D,DIS,CBL
CO 1,CO 6,CO 7,CO 8	Demonstrate the Patient-centric evaluation of Matra.	3	Practical Training 18.5	PSY-GUD	Shows-how	DIS,D
CO 1,CO 2,CO 6,CO 7	Demonstrate the utility of posology principles from an ayurvedic and modern pharmacology perspective.	4	Experiential-Learning 18.6	PSY-GUD	Shows-how	DIS,CBL

M 18 Unit 4 Concept of drug repurposing

- 4.1 Concept of drug repurposing
 4.2 Systematic approaches to drug repurposing
 4.3 Strategies of drug repurposing
 4.4 Methodologies of drug repurposing

References: 215,216,217,218

3A	3B	3C	3D	3E	3F	3G
CO 6,CO 7,CO 8	Describe the concept, need, and key aspects of drug repurposing.	1	Lecture	CC	Knows-how	JC,BS,PrBL
CO 5,CO 6,CO 8	Describe systematic approaches to drug repurposing	1	Lecture	CAP	Knows-how	BS,DIS
CO 5,CO 6,CO 7,CO 8	Discuss strategies and methodologies of drug repurposing.	1	Lecture	CAP	Knows-how	DIS,L&PPT

CO 5,CO 6,CO 7,CO 8	Demonstrate the analysis of classical ayurvedic drugs for novel indications.	5	Practical Training 18.6	PSY-GUD	Shows-how	DL,LRI,D,DIS,IBL
CO 5,CO 6,CO 7,CO 8	Evaluate novel indications for classical Ayurvedic formulations	3	Experiential-Learning 18.7	PSY-MEC	Shows-how	BS,DIS,CBL
CO 6,CO 7,CO 8	Demonstrate the Reverse pharmacological approach for drug repurposing in Ayurveda	2	Experiential-Learning 18.8	PSY-MEC	Shows-how	JC,DIS,B S

Practical Training Activity

Practical Training 18.1 : Demonstration of chrono therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics.

The teacher will create a case scenario or select a case from the Hospital records and describe the chrono-therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics. The teacher will describe the rationale for the selection of specific Oushadha Sevana Kala based on various factors like dosha, Agnibala, Rogabala, age etc. The students will record the observations, present, and discuss.

Practical Training 18.2 : Demonstration of Modulation of dosage form action by chronotherapeutic administration in Ayurveda

The teacher will select a dosage form and demonstrate the suitable Oushadha Sevana Kala for the selected dosage form based on classical guidelines of Oushadha Sevana Kala and Chronotherapeutics.

Practical Training 18.3 : Demonstration of appropriate Anupana for the selected dosage form in different clinical conditions.

The teacher will select a dosage form and demonstrate its therapeutic application in various clinical conditions using different Anupana. The teacher will explain the rationale for selecting the specific Anupana in appropriate clinical conditions.

Practical Training 18.4 : Demonstration of the calculation of paediatric dose using different formulae.

The teacher will select one formulation and demonstrate the method of converting the adult dose into a suitable paediatric dose. Each student will be allotted five classical formulations, and students will convert adult doses into paediatric doses by adopting traditional methods and modern dose calculation techniques (Clark's, Dilling's and Young's formulae).

Practical Training 18.5 : Demonstration of the Patient-centric evaluation of Matra.

The teacher will demonstrate modification of the dose in a case scenario, which contains / the details of Prakruti, Agni, Roga bala, Rogi bala etc.. Each student will be assigned different case scenarios, and the students will be asked to modify the dose according to the case scenario based on the parameters demonstrated by the teacher.

Practical Training 18.6 : Re-analysing classical ayurvedic drugs for novel indications

The teacher will select a classical Ayurvedic formulation and list out the ingredients and therapeutic indications of the formulation. With the available modern research articles on the pharmacological insights of the formulation's ingredients, the teacher will propose and justify a potential new therapeutic use for that formulation.

Experiential learning Activity

Experiential-Learning 18.1 : Exploring chrono therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics.

The teacher will create different case scenarios or select cases from the Hospital records and allot each student with a different case/scenario. The student will carry out the chrono-therapeutic alignment of oushadha sevana kala with patient–disease dynamics. The student will present the case and describe the rationale for the selection of specific Oushadha Sevana Kala based on various factors like dosha, agnibala, rogabala, age etc.

Experiential-Learning 18.2 : Exploring the modulation of the action of the dosage form by chronotherapeutic administration in Ayurveda.

The teacher will randomly select different case files from the hospital, select different dosage forms from the prescription, and instruct the students to align a specific Oushadha Sevana Kala for the selected formulation. The students will present their findings with rationality and discuss

Experiential-Learning 18.3 : Enlisting appropriate Anupanas for various formulations in different clinical conditions.

The teacher will assign five formulations to each student and ask them to prepare a worksheet for each formulation, suggesting suitable Anupana for different clinical conditions. The students will present their findings and discuss

Experiential-Learning 18.4 : Optimising drug response through synergistic Anupana integration.

Each student will analyse five classical formulations along with the indicated anupana to explore the logic behind synergistic combinations. The students will evaluate and present how anupana contributes to better drug assimilation and targeted action.

Experiential-Learning 18.5 : Exploring the role of Anupana in the modulation of drug tolerance and safety.

The students will select five classical formulations and analyse the textual references and Ayurvedic principles that prescribe specific anupana to balance ushna, teekshna,

and other potent drug qualities. The students will understand how anupana acts as a bio-modifier and a natural buffer by reducing the irritation, protecting the dhatus, improving drug compatibility and ensuring drug safety and tolerability. OR The teacher will instruct each student to explore a published article on the role of Anupana in drug safety and efficacy. The students will search the article, critically analyse, present their findings, and discuss in the class	
Experiential-Learning 18.6 : Exploring posology principles from an ayurvedic and modern pharmacology perspective.	
The teacher will demonstrate modification of the dose in a case scenario, which contains / the details of Prakruti, Agni, Roga bala, Rogi bala etc.. Each student will be assigned different case scenarios, and the students will be asked to modify the dose according to the case scenario based on the parameters demonstrated by the teacher.	
Experiential-Learning 18.7 : Exploring novel indications for classical Ayurvedic formulations	
Each student will be allotted five formulations, and students will evaluate the new therapeutic use of that formulation. With the available modern research articles on the pharmacological insights of the formulation's ingredients, the students will propose and justify a potential new therapeutic use for that formulation	
Experiential-Learning 18.8 : Exploring the Reverse pharmacological approach for drug repurposing in Ayurveda	
The students will explore various scientific articles for successful clinical case studies of classical ayurvedic formulations for new indications (COVID, lifestyle disorders, etc). Students will create a pharmacological profile of the ingredients of the formulation from the ayurvedic text and the modern context. The students will link the clinical success of the formulation to the pharmacological profile of the ingredients of the formulation.	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. 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 points Select any two activities for 25 marks each (2 x 25 = 50 Marks): 1.VIVA 2.Structured LAQ 3.Interaction on concept of Posology 4.Class presentation on the concept of Anupana 5.Project based analysis OR	4

Any practical in converted form can be taken for assessment. (25 Marks)
and
Any experiential learning method in converted form can be taken for assessment (25 marks)

Semester No : 4

Module 19 : SOP and clinical application of Chaturvidha Rasayana

Module Learning Objectives

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

1. Describe SOP, significance, and clinical application of Khalveeya Rasayana
2. Discuss SOP, significance, mechanism of action, clinical applications with Pathya-Apathya of Parpati Kalpana
3. Describe SOP, role of Gandhaka Drava paka, significance, and clinical attributes of Pottali Rasayana
4. Discuss SOP, Significance, role of Kramagni Paka, and clinical application of Kupipakwa Rasayana

- M 19 Unit 1 Standard Operating Procedure (SOP) and Clinical Application of Khalveeya Rasayana**
- 1.1 Definition and significance of Khalveeya Rasayana
 - 1.2 Standard Operating Procedure for the preparation of Khalveeya Rasayana
 - 1.3 Role of bhavana in potentiating Khalveeya rasayana
 - 1.4 Clinical application of Khalveeya Rasayana with examples

References: 219,220

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Describe the unique features, types, and significance of parpati kalpana.	2	Lecture	CC	Knows-how	DIS
CO 1,CO 2,CO 6	Discuss the role of bhavana (pharmacodynamics of trituration) in potentiating kharaleeya rasayana.	1	Lecture	CAP	Knows-how	DIS,BS

CO 1,CO 2,CO 6	Demonstrate the method of preparation and SOP of Kharaleeya Rasayana.	7	Practical Training 19.1	PSY-GUD	Shows-how	BS,D,DIS
CO 1,CO 2,CO 6	Appraise the utility of kharaleeya rasayana to clinical case practice.	4	Experiential-Learning 19.1	PSY-ADT	Shows-how	DIS
CO 1,CO 4,CO 6	Demonstrate the impact of Bhavana (A bioactivation tool) in Kharaleeya Rasayana.	3	Experiential-Learning 19.2	PSY-GUD	Shows-how	CBL,DIS

M 19 Unit 2 SOP and clinical application of Parpati Rasayana2.1 Definition and significance of Parpati

2.2 Standard Operating Procedure for the preparation of Parpati with process validation

2.3 Mechanism of action of Parpati kalpana

2.4 Pathyapathya in Parpati Prayoga and its significance

2.5 Clinical application of Parpati Kalpa with examples

References: 95,98,101,102,103,104,106,107,109,113,115,221,222,223,224

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 6	Describe the unique features, types, and significance of parpati kalpana.	1	Lecture	CC	Knows-how	DIS,L&PPT ,L&GD,JC
CO 1,CO 6	Discuss SOP and quality control parameters of Parpati Kalpa	1	Lecture	CC	Knows-how	L&PPT , DIS,L&GD,PL
CO 1,CO 6	Discuss in detail the pathya-apathya,matra, prayoga of parpati kalpana.	1	Lecture	CC	Knows-how	BS,DIS,L &GD
CO 1,CO 6	Review and analyze research updates on Parpati Kalpana	1	Lecture	CAN	Knows-	CBL,JC,

					how	DIS
CO 1,CO 6,CO 7	Demonstrate the SOP of parpati kalpana.	7	Practical Training 19.2	PSY-GUD	Shows-how	D
CO 1,CO 6	Evaluate the pharmacodynamic rationale and clinical application of parpati kalpana.	4	Experiential-Learning 19.3	PSY-ADT	Does	RLE,DIS, PBL,BS

M 19 Unit 3 SOP and clinical application of Pottali Rasayana

3.1 Definition and significance of Pottali rasayana

3.2 Standard Operating Procedure for the preparation of Pottali Kalpa with process validation

3.3 Role of Gandhaka drava paka in the preparation Pottali rasayana

3.4 Special clinical attributes of Pottali with examples

References: 48,58,59,61,65,90,94,95,96,97,98,102,225,226,227

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Define pottali and discuss in detail the concept, types, and significance of pottali rasayana.	1	Lecture	CC	Knows-how	CBL,BL, DIS,BS
CO 1,CO 2,CO 6	Discuss in detail the various classical methods of preparation of pottali kalpana.	1	Lecture	CS	Knows-how	L_VC,DIS,IBL,L&PPT
CO 1,CO 4,CO 5,CO 6	Discuss the standardization and quality control parameters for Pottali Kalpa	1	Lecture	CC	Knows-how	L&PPT ,BS,LRI
CO 1,CO 2,CO 6	Evaluate the safety and efficacy of Pottali Rasayana	1	Lecture	CE	Knows-how	JC,BS
CO 1,CO 4	Demonstrate the method of preparation and SOP of pottali kalpana.	8	Practical Training 19.3	PSY-GUD	Shows-how	D-BED,D ,DIS
CO 1,CO 4	Prepare Pottali following SOP	8	Experiential-	PSY-	Does	DIS

			Learning 19.4	MEC		
CO 1,CO 2,CO 6,CO 7	Analyse the pharmacological profile of the ingredients, bhavana dravya, and the pharmaceutical procedure adopted in achieving therapeutic precision.	5	Experiential-Learning 19.5	PSY-MEC	Shows-how	CBL,PrBL
M 19 Unit 4 SOP and clinical application of Kupipakwa Rasayana 4.1 Definition and significance of Kupipakwa rasayana 4.2 Standard Operative Procedure for the preparation of Kupipakwa Rasayana with process validation 4.3 Role of Kramagni paka in preparation of Kupipakwa Rasayana 4.4 Chemistry of Kupipakwa rasayana 4.5 Clinical application of Kupipakwa Rasayana Kalpa with examples References: 94,98,102,104,106,107,228,229						
3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss the concept and significance of Kupipakwa Rasayana.	1	Lecture	CC	Knows-how	BS,DIS
CO 1,CO 2,CO 4	Describe in detail the role of Kramagni Paka in the preparation of Kupipakwa Rasayana.	1	Lecture	CC	Knows-how	L_VC,DIS,BS,L&PPT
CO 1,CO 2,CO 6	Describe the role of gandhaka jarana in the context of sagandha kupipakwa rasayana.	1	Lecture	CC	Knows-how	LS,DIS,L&PPT
CO 1,CO 4,CO 7	Discuss the thermo–chemistry of kupipakwa rasayana.	1	Lecture	CC	Knows-how	IBL,DIS,BS
CO 1,CO 2,CO 4	Demonstrate the method of preparation and SOP of Kupipakwa Rasayana.	8	Practical Training 19.4	PSY-GUD	Shows-how	DL,DIS,D
CO 1,CO 2,CO 4	Prepare the selected Kupipakwa Rasayana	10	Experiential-Learning 19.	PSY-GUD	Shows-how	CBL,DL,D

			6			
CO 1,CO 2,CO 6,CO 7	Demonstrate the scientific rationality for the selection of specific Kupipakwa Rasayana in the given scenario..	5	Experiential-Learning 19.7	PSY-GUD	Shows-how	PSM,PrBL,PBL,CBL,DIS
Practical Training Activity						
Practical Training 19.1 : DOAP of preparation and SOP of Kharaleeya Rasayana.						
The teacher will select a Khalveeya Rasayana and will instruct the students to prepare it following SOP in a step-wise manner. The students will prepare the product under the direct observation of the teacher. They will observe the key steps of the preparation and record the SOP for that formulation. Each student will be assigned two different Kharaleeya rasayana formulations. They will prepare and frame an SOP for that formulation.						
Practical Training 19.2 : Demonstration of the method of preparation based on SOP of parpati kalpana.						
The teacher will demonstrate the method of preparation of a selected parpati kalpa in a step-wise manner. Students will observe the key steps of the preparation and frame an SOP for that formulation. The teacher will arrange for a video demonstration of the instrumentation used for the preparation of Parpati Kalpa. Each student will be assigned two different parpati kalpana. They will prepare the product, record the findings like melting point, temperature pattern, tests for perfection etc, and frame an SOP for that formulation. The students will demonstrate the preparation of a Sagandha and a Nirgandha Parpati to undergraduate students as per the NCISM syllabus.						
Practical Training 19.3 : Demonstration of the method of preparation and SOP of pottali kalpana.						
The teacher will demonstrate the method of preparation of a selected pottali Kalpana following the Gandhaka Paka method in a step-wise manner. Students will observe the key steps of the preparation and frame an SOP for that formulation. They will present their findings and discuss						
Practical Training 19.4 : Demonstration of the method of preparation and SOP of Kupipakwa Rasayana.						
The teacher will select one Sagandha and one Nirgandha Kupipakwa Rasayana and demonstrate the method of preparation of the selected product in a step-wise manner. Students will assist following the guidelines of teacher, observe the key steps of the preparation and frame an SOP for that formulation.						
Experiential learning Activity						
Experiential-Learning 19.1 : Validation of utility of kharaleeya rasayana to clinical case practice.						

Each student will be assigned two different clinical case scenarios and asked to suggest appropriate kharaleeya rasayana formulations for each of them, providing justification for their selection based on classical references, dosha involvement, and therapeutic relevance, and present and discuss.

OR

The teacher will instruct each student to select a prescription of Khalveeya Rasayana for a selected disease and justify the prescription with the help of the probable mode of action.

They may also refer to the published articles on the clinical application of Khalveeya Rasayana and discuss

Experiential-Learning 19.2 : Demonstration of the impact of Bhavana – A bioactivation tool in Kharaleeya Rasayana.

Each student will be assigned a kharaleeya rasayana in which several bhavana dravyas are used. The students will analyse the impact of bhavana dravya on the organoleptic, physical, chemical, biological, safety, pharmacodynamic, and pharmacokinetic profiles of the formulation from ayurvedic and modern perspectives.

Experiential-Learning 19.3 : The pharmacodynamic rationale and clinical application of parpati kalpana.

Each student will be assigned two parpati rasayana. The student will analyse the pharmacodynamic actions (dosha karma, dhatu karma, srotogamitva etc) as of each parpati and justify the therapeutic potential of that parpati with the help of classical references and research articles.

OR

The teacher will instruct each student to select a prescription of Parpati Kalpa for a selected disease and justify the prescription with the help of the probable mode of action. The students will also note the Pathya-Apathya advised and mode of administration of Parpati (Samanya or Kalpa Prayoga) and discuss.

Experiential-Learning 19.4 : Preparation of Pottali following SOP

The teacher will assign each student a different pottali kalpa or a pottali Kalpa prepared by using different methods. The students will prepare the assigned pottali following SOP and present their observations.

Experiential-Learning 19.5 : Analysis of the pharmacological profile of the ingredients, bhavana dravya, and the pharmaceutical procedure adopted in achieving therapeutic precision.

Each student will be assigned a Pottali Kalpana. They will analyse the pharmacological profile of the ingredients, bhavana dravya, and the pharmaceutical procedure adopted in achieving therapeutic precision.

Students will refer to classical texts and scientific articles and explore the dual importance of bhavana (wet trituration) and bandhana (tying technique) in developing a compact, portable, uniform (precise size and volume), potent, safe, and stable pottali kalpana.

Experiential-Learning 19.6 : Preparation of selected Kupipakwa Rasayana

The teacher will assign one Sagandha and one Nirgandha Kupipakwa Rasayana for the group of students (other than the ones prepared in practical). The students will prepare the allotted formulation following SOP, record their findings, present the same and discuss	
Experiential-Learning 19.7 : Demonstration of the scientific rationality for the selection of specific Kupipakwa Rasayana in the given scenario..	
Each student will be assigned one kupipakwa rasayana. The students will refer to classical texts, scientific articles, and list out the rejuvenative and therapeutic potential of that formulation. They will also critically analyse the potency of the formulation by applying the principles of pharmacodynamics and pharmacokinetics. OR Each student will search for a prescription containing Kupipakwa Rasayana in hospital files, Note down the dose, Anupana, duration, present the same with scientific rationality for the selection of particular Kupipakwa Rasayana in that specific condition, probable mechanism of action and therapeutic outcome	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 75 marks for this module. 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 points Select any three activities for 25 marks each (3 x 25 = 75 Marks): 1. Compilation work: Students are given a specific topic for compilation work. Gathered information is categorised, analysed and presented 2. Structured LAQ on Chemistry of Kupipakwa Rasayana 3. Case presentation on clinical application of Parpati Rasayana 4. Class presentation on Chaturvidha Rasayana 5. Viva Voce AND Any two practicals in converted form can be taken for assessment. (2X25 = 50 Marks) and Any experiential learning method in converted form can be taken for assessment (25 marks)	6
Module 20 : SOP and Clinical application of Ayaskriti, Louha, and Mandura Kalpa	
Module Learning Objectives (At the end of the module, the students should be able to)	

1. Describe the concept of Ayaskriti, with SOP, clinical applications, and safety concerns of Ayaskriti
2. Discuss the concept, SOP, clinical applications, and key chemical considerations of Louha Kalpa
3. Discuss the concept, SOP, and clinical applications of Mandura Kalpa

M 20 Unit 1 SOP and clinical application of Ayaskriti

- 1.1 Ayaskriti.
- 1.2 Standard Operating Procedure for the preparation of Ayaskriti
- 1.3 Types (forms) of ayaskriti.
- 1.4 Method of administration and clinical utility of Ayaskriti.
- 1.5 Safety concerns of Ayaskriti.

References: 228,229,237,238,239,243

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss in detail the concept of Ayaskriti, its types, method of administration, and safety concerns.	1	Lecture	CC	Knows-how	DIS,L&P PT
CO 1,CO 2	Demonstrate the SOP and preparation of Ayaskriti.	3	Practical Training 20.1	PSY-GUD	Shows-how	
CO 1,CO 2,CO 6	Evaluate the role of Ayaskriti.as a multi-target formulation.	4	Experiential-Learning 20.1	PSY-MEC	Shows-how	BS,CBL

M 20 Unit 2 SOP and clinical application of Louha kalpa

- 2.1 Pharmaceutical vistas of Louha Kalpas
- 2.2 Key chemical considerations in Louha Kalpa
- 2.3. Pharmacology and clinical utility of Louha kalpa

References: 60,98,102,104,106,107,232,233,400

3A	3B	3C	3D	3E	3F	3G
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CO 1,CO 2	Discuss the concept of Louha Kalpa.	1	Lecture	CC	Knows-how	DIS
CO 1,CO 2,CO 4,CO 8	Discuss the key chemical considerations in Louha Kalpa.	1	Lecture	CC	Knows-how	BL,JC,DIS,L&PPT
CO 1,CO 2,CO 6	Demonstrate the SOP and preparation of Louha Kalpa.	3	Practical Training 20.2	PSY-GUD	Shows-how	D,DIS
CO 1,CO 2,CO 6	Apply Louha Kalpa by integrating through textual insights with real word cases for the therapeutic purpose.	4	Experiential-Learning 20.2	PSY-ADT	Shows-how	CBL,PrBL,IBL,DIS,ML

M 20 Unit 3 SOP and Clinical application of Mandura Kalpa

3.1 Concept of mandura kalpa and its SOP.

3.2 Types of mandura kalpa based on the method of preparation.

3.3 Significance of go mutra in mandura kalpa

3.4 Clinical application of mandura kalpa.

References: 102,104,106,107,109,153,234,235,236,237,238,239,243,262,400

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Discuss the concept and pharmaceutical vistas of Mandura Kalpa	1	Lecture	CC	Knows-how	L&PPT , L&GD,DIS
CO 4,CO 5,CO 8	Describe chemistry and pharmacology associated with structure and preparation of Mandura Kalpas	1	Lecture	CC	Knows-how	TBL,BS, L&GD,L &PPT
CO 1,CO 2,CO 7	Demonstrate the SOP and preparation of Mandura Kalpa.	2	Practical Training 20.3	PSY-GUD	Shows-how	D
CO 1,CO 6	Demonstrate the clinical application of Mandura Kalpa.	2	Practical Training 20.4	PSY-GUD	Shows-how	CBL,DIS

CO 7,CO 8	Evaluate the role of Gomutra in pharmaceutical processing and as a bio enhancer	5	Experiential-Learning 20.3	PSY-MEC	Does	BS,CBL, PrBL
Practical Training Activity						
Practical Training 20.1 : Demonstration of the SOP and preparation of Ayaskriti.						
The teacher will describe the complete process of Ayaskriti preparation in a step-wise manner as per different classical texts. The students will prepare Ayaskriti as per the reference of Sushruta Samhita (Churna form) under the direct supervision of the teacher. Students will observe, document, and present the preparation along with SOP framework and discuss.						
Practical Training 20.2 : Demonstration of the SOP and preparation of Louha Kalpa.						
The teacher will select a Louha Kalpa and demonstrate its method of preparation in a detailed step-by-step manner. Students will observe, document, and frame SOP for that formulation. The teacher will allot the students with a different Louha Kalpa to be prepared by a different method. The students will prepare it under teacher's guidance, frame SOP, present, and discuss. The teacher will select a different formulation for every batch						
Practical Training 20.3 : Demonstration of the SOP and preparation of Mandura Kalpa..						
The teacher will select a Mandura Kalpa.a and demonstrate its method of preparation in a detailed step-by-step manner. Students will observe, document, and frame SOP for that formulation. The teacher will allot the students with another mandura kalpa, prepare it under teacher's guidance, frame SOP, present, and discuss.						
Practical Training 20.4 : Clinical application of mandura kalpa.						
The teacher will demonstrate the clinical application of mandura kalpa in a case scenario. The teacher will explain the idea behind prescribing that particular kalpa in that case along with its matra, anupana, pathya apathya. Students will select another case scenario, suggest suitable mandura kalpa for it, and justify the rationale behind it. OR The teacher will instruct each student to explore at least two prescriptions of Mandura Kalpa from the hospital files. The students will note down the dose, Anupana, clinical condition where it was used, and therapeutic outcomes. The teacher will describe the rationality of prescription and probable mechanism of action						
Experiential learning Activity						
Experiential-Learning 20.1 : Decoding the role of Ayaskriti. as a multi-target formulation.						
The students will list out the individual ingredients of Ayaskriti and their clinical indications as per classical references. They will explore the rationale of these ingredients						

in making the ayaskriti potent in managing various clinical conditions like pandu, prameha, etc. They will also refer scientific articles and case studies which substantiate the clinical efficacy of Ayaskriti.

Experiential-Learning 20.2 : Application of Louha Kalpa by integrating through textual insights with real word cases for the therapeutic purpose.

Each student will be assigned one Louha Kalpa. The students will refer to the classical texts and list out the ingredients, method of preparation, pharmacological properties of the ingredients, indications, dose, and Anupana. Students will connect classical references from ayurvedic texts with contemporary clinical case studies, thereby enabling them to apply the textual insights into real-world therapeutic case scenarios. Each student will present their findings and discuss.

Experiential-Learning 20.3 : Gomutra as a medium of pharmaceutical processing and as a bio enhancer – “Re-evaluating its role in mandura kalpa.”

The teacher will instruct each student to carry out pharmaceutical processes like Shodhana where Gomutra is used. The students will carry out the practical, record their observations, and present them and discuss

The students will list out mandura kalpas containing gomutra. They will critically evaluate how go mutra functions as a bio enhancer in the preparation of the mandura kalpa, enhancing therapeutic potency, absorption, and clinical efficacy from both ayurvedic and modern pharmacological perspectives. The students will also refer to the scientific articles which substantiate the role of gomutra in attaining therapeutic benefits.

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The assessment will be for 25 marks for this module. 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 points

2

Select any one of the activities for 25 marks each (1 x 25 = 50 Marks):

1.Presentation of Ayashriti Kalpana

2.Structured LAQ on Pharmaceutical vistas of Louha Kalpa

3.Interaction/Viva voce

OR

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

OR

Any experiential learning method in converted form can be taken for assessment (25 marks)

Semester No : 5

Module 21 : Clinical application of Rasoushadhi according to Srotas and in selected challenging clinical conditions**Module Learning Objectives****(At the end of the module, the students should be able to)**

1. Describe the clinical applicability of Rasa oushadhi specific to Srotas
2. Assess the base for exploring Rasa oushadhi in Clinical Emergencies and present health care challenges.
3. Apply Rasoushadhi in clinically challenging cases.

M 21 Unit 1 Clinical application of Rasoushadhis specific to Srotas
1.1. Concept and rationality of selection and application of Rasoushadhi according to Srotas
1.2. Clinical application of Rasouashdhi in disorders of different Srotas

References: 104,237,238,239,240,241

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 6	Discuss Srotas-specific Rasoushadhi, tailored Ayurvedic formulations for individual biological channels	1	Lecture	CC	Knows-how	DIS,CBL,BS
CO 1,CO 2,CO 6	Enlist and discuss Rasoushadhi for different Srotas, explaining their therapeutic efficacy and mechanism of action.	1	Lecture	CAP	Knows-how	L&GD,IBL,DIS,L&PPT
CO 1,CO 2,CO 6	Demonstrate the clinical application of Rasoushadhi in selected Srotas, illustrating their practical utility and therapeutic outcomes in addressing specific health conditions.	3	Practical Training 21.1	PSY-GUD	Shows-how	CBL,D-BED,BS
CO 1,CO 2,CO 6	Illustrate the therapeutic application of Rasoushadhi in different Srotas	3	Experiential-Learning 21.1	PSY-ADT	Shows-how	BS,PER,CBL,PrBL

M 21 Unit 2 Clinical application of Rasoushadhi in emergency conditions
2.1 Role of Rasoushadhis in Managing Medical Emergencies
2.2 Specific Rasa Yogas among Chaturvidha Rasayana kalpas for Managing Medical Emergencies

2.3 Application of Pottali Kalpa in Emergency Management

References: 104,237,238,239,240,241,242,243,244,245,246,247,248

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss the unique properties of Rasoushadhi, enabling its use in clinical emergencies.	1	Lecture	CC	Knows-how	BS,CBL
CO 1,CO 6	Enlist specific Rasa Yogas for managing medical emergencies and discuss their rationality, highlighting the therapeutic mechanisms and clinical applications	1	Lecture	CC	Knows-how	BS,DIS,L &PPT ,CBL
CO 1,CO 2,CO 6	Demonstrate the clinical applicability of Rasoushadhi in Medical Emergencies	3	Practical Training 21.2	PSY-GUD	Shows-how	
CO 1,CO 2,CO 6	Apply the appropriate Rasa Oushadhi in a allotted /selected Medical Emergency conditions.	4	Experiential-Learning 21.2	PSY-ADT	Shows-how	BS,D,DIS ,CBL,SI M

M 21 Unit 3 Rasoushadhi in specific, clinically challenging conditions3.1 Rational application of Rasoushadhi in cancer

3.2 Application of Rasoushadhi in neurodevelopmental conditions

3.3 Utility of Rasoushadhi in neurodegenerative conditions

References: 95,102,104,106,249,250,251,252,253,254,255,256,257,258,259,260,261

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss the role of Rasoushadhi in clinically challenging conditions like cancers, neurodevelopmental and neurodegenerative disorders	1	Lecture	CAP	Knows-how	CBL,IBL, L_VC,L& PPT ,DIS
CO 1,CO 2,CO 6	Demonstrate the role of Rasoushadhi in clinically challenging conditions	2	Practical Training 21.3	PSY-GUD	Shows-how	D,DIS

CO 1,CO 2,CO 6	Demonstrate the role of Rasoushadhi as Rasayana in clinically challenging conditions.	2	Practical Training 21.4	PSY-GUD	Shows-how	D,DIS,BS ,CBL
CO 1,CO 2,CO 6	Evaluate the role of Rasoushadhi in clinically challenging conditions such as Cancer.	3	Experiential-Learning 21.3	PSY-GUD	Shows-how	BS,PBL,P rBL,CBL, DIS
CO 1,CO 6	Explore the role of Rasoushadhi in clinically challenging conditions such as neurodevelopmental and neurodegenerative diseases.	3	Experiential-Learning 21.4	PSY-ADT	Does	BS,CBL, DIS

Practical Training Activity

Practical Training 21.1 :

Demonstration of the clinical application of Rasoushadhi in selected Srotas, illustrating their practical utility and therapeutic outcomes in addressing specific health conditions.

The teacher will select a Srotas and enlist the Rasoushadhi (Ayurvedic formulations) applicable for clinical conditions related to that Srotas. The teacher will then demonstrate the rationality and probable mode of action of the selected formulation based on the classical properties and pharmacology of its ingredients. Additionally, the teacher will analyze the findings of any relevant scientific articles published on the chosen formulation.

OR

The teacher will select a Rasoushadhi prescribed in a randomly selected case file from the hospital and describe the rationality of selecting the formulation for the specific Srotas involved in the patient's condition. The teacher will also discuss the clinical outcome achieved with the selected formulation.

Practical Training 21.2 : Demonstration of the clinical applicability of Rasoushadhi in Medical Emergencies

The teacher will select a particular emergency condition and identify the applicable Rasa Oushadhi from Chaturvidha Rasayana. The teacher will then select a specific formulation and instruct the students to prepare it under their direct supervision. Students will record their observations and participate in a discussion. Following this, the teacher will demonstrate the rationality and probable mode of action of the selected formulation, drawing on classical properties, pharmacology of individual ingredients, and the method of preparation. Additionally, the teacher will analyze the findings in relation to published research works.

Practical Training 21.3 : Demonstration of role of Rasoushadhi in clinically challenging conditions

The teacher will select a relevant Rasoushadhi applicable in clinically challenging conditions, such as neurodevelopmental and neurodegenerative diseases. The teacher will then demonstrate the clinical application of the selected formulation, including the suitable Anupana (vehicle) and route of administration. Furthermore, the teacher will

discuss the probable mechanism of action of the selected formulation, drawing on the classical properties and pharmacology of its ingredients.

OR

The teacher will demonstrate the therapeutic application of selected Rasoushadhis in managing specific, clinically challenging conditions within their respective outpatient departments (OPDs).

Practical Training 21.4 : Demonstration of the role of Rasoushadhi as Rasayana in clinically challenging conditions.

The teacher will select a specific Rasa yoga renowned for its Rasayana properties and instruct the students to prepare it, employing methods such as Shodhana, to enhance its Rasayana attributes. The teacher will then demonstrate the rationality and probable mode of action of the selected Rasa oushadhi, highlighting the significance of its Rasayana properties in addressing clinically challenging cases, including certain stages of cancer and neurodegenerative diseases. Furthermore, the prepared formulation will be critically analyzed to elucidate its mode of action, drawing on the pharmacology of individual ingredients and relevant published research works.

Experiential learning Activity

Experiential-Learning 21.1 : Therapeutic application of Rasoushadhi in different Srotas

Rasoushadhi applicable to their allotted Srotas. Students will then investigate the rationality and probable mode of action of the selected formulation, drawing on the classical properties and pharmacology of its ingredients. Additionally, they will analyze the findings of relevant scientific articles published on the chosen formulation.

OR

The teacher will assign each student a different Rasoushadhi prescribed in a randomly selected case file from the hospital. Students will then explore the rationality of the allotted Rasoushadhi concerning the specific Srotas involved in the patient's condition, as well as the resulting clinical outcome. Students will record their findings, present them, and engage in a class discussion.

Experiential-Learning 21.2 : Exploring the clinical utility of Rasoushadhi in Medical Emergencies

The teacher will select certain emergency conditions and instruct the students to explore and list the relevant Rasoushadhi from Chaturvidha Rasayana. Each student will then be assigned a different formulation from the listed Rasoushadhi to prepare, record their observations, and present their findings. Following this, students will delve into the rationality and probable mode of action of their allotted formulations, drawing on the classical properties and pharmacology of the ingredients. Additionally, they will analyze the findings of relevant scientific articles published on their assigned formulations.

Experiential-Learning 21.3 : Exploring the role of Rasoushadhi in clinically challenging conditions such as Cancer.

The teacher will assign each student a different Rasa Yoga that can be used to manage various stages of cancer. Students will then explore the rationality and probable mode of action of their assigned Rasa Oushadhi in different stages of a particular type of cancer, drawing on classical properties, pharmacology of ingredients, and analyzing relevant published research works

Experiential-Learning 21.4 : The role of Rasoushadhi in clinically challenging conditions such as neurodevelopmental and neurodegenerative diseases.

The teacher will assign each student a different Rasa Yoga capable of managing various neurodegenerative conditions. Students will then explore the rationality and probable mode of action of their allotted formulation, drawing on classical properties and pharmacology of ingredients, and analyze its rationale concerning published research articles.

OR

The teacher will instruct each student to select a neurodevelopmental or neurodegenerative case from the hospital's case records. Students will then identify the Rasoushadhi prescribed in the case, analyze the rationality behind its prescription, and evaluate the resulting clinical outcome.

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 25 marks for this module. 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 points Select any one of the activities for 25 marks each (1 x 25 = 50 Marks): 1.Case based presentation on Srotas-specific Rasoushadhi 2.Debate on clinical utility of Rasa Oushadhi in Medical Emergencies 3.Structured LAQ 4.Interaction/Viva voce OR Any practical in converted form can be taken for assessment. (25 Marks) OR Any experiential learning method in converted form can be taken for assessment (25 marks)	2

Module 22 : Yogas from different Kalpanas

Module Learning Objectives

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

1. Describe the various pharmaceutical dosage forms and their application in multiple diseases.
2. Integrate pharmaceutical knowledge with clinical applications to develop various dosage forms.

3. Design and develop newer dosage forms according to present-day needs and present challenges.
4. Evaluate the challenges in the pharmaceutical industry in the large-scale production of newer dosage forms apt for present needs.
5. Access databases and journals for updates regarding newer technologies in the pharmaceutical industry for developing newer dosage forms, taking into account the emerging demands.

M 22 Unit 1 SOP of Vati, Gutika, Guggulu and Varti Kalpas and their therapeutic applications

1.1 SOP of selected Vati preparation including packing, storage, and therapeutic applications

1.2. SOP regarding preparation of selected formulations from Guggulu Kalpana, including packing, storage, and therapeutic applications

1.3. Types of Varti and their SOP

1.4. Clinical applications of different Varti

1.5. Suppositories and pharmaceutical modifications of Ayurvedic suppositories

References: 102,262,263,264,265,266,267,268,269,270,271,272

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 6	Describe the therapeutic significance of vati kalpana	1	Lecture	CAP	Knows-how	DIS,L&G D,BS
CO 1,CO 6	Summarize the therapeutic significance of Guggulu Kalpa and Varti Kalpana	1	Lecture	CAP	Knows-how	DIS,BL,C _L,BS,L &PPT
CO 6,CO 7,CO 8	Discuss modern aspects of solid dosage forms	1	Lecture	CC	Knows-how	PER,L&P PT
CO 1,CO 7,CO 8	Demonstrate the preparation of Vati, Guggulu Kalpa, and their modified modern dosage forms	5	Practical Training 22.1	PSY-GUD	Shows-how	DIS,D
CO 1,CO 2,CO 4	Design an S.O.P for the preparation of Ayurvedic suppository specifying its clinical utility based on Varti Kalpana	4	Practical Training 22.2	PSY-GUD	Shows-how	

CO 1,CO 2,CO 6	Analyse the role of Gugulu Kalpana in various clinical conditions by selecting a specific Gulggulu Yoga.	8	Experiential-Learning 22.1	PSY-MEC	Knows-how	BS,CBL
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M 22 Unit 2 SOP and Clinical applications of Avaleha and Khanda kalpana 2.1. SOP of Avaleha preparation with suitable Leha yogas

2.2. Therapeutic application of different varieties of Avaleha yogas

2.3. SOP of Khanda kalpana with suitable Khanda Yogas

2.4. Therapeutic application of different varieties of Khanda yogas

References: 273,274,275,276,277,278,279,280

3A	3B	3C	3D	3E	3F	3G
CO 1	Discuss the therapeutic significance of Avaleha kalpana	1	Lecture	CAP	Knows-how	L&GD,L &PPT
CO 1,CO 2,CO 6	Discuss therapeutic significance of Paka and Khanda kalpana	1	Lecture	CAP	Knows-how	L&GD,DIS,BS
CO 5,CO 6,CO 7,CO 8	Discuss modern semisolid dosage forms	1	Lecture	CC	Knows-how	DIS,LS,IBL,BS,BL
CO 1	Demonstrate the role of pharmaceutical additives and Samyak Paka of Avaleha	5	Practical Training 22.3	PSY-GUD	Shows-how	D,DIS
CO 1,CO 2,CO 6	Analyse the role of selected leha yoga in different clinical conditions	8	Experiential-Learning 22.2	PSY-MEC	Does	D,DIS

M 22 Unit 3 SOP of Sneha Kalpana and its clinical significance 3.1. Different categories of Sneha with special reference to therapeutic application

3.2. Relevance of Avarthita Taila, Taila murchana and Taila Paka with special reference to critical endpoints

3.3. SOP of Sneha kalpana in selected formulations

3.4. Therapeutic application of selected Ghrita yogas and Taila yogas

References: 90,278,279,280,281,282,283,284,285,286,287,288

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Discuss the concept of Sneha Kalpana with special reference to critical end points (Sneha Paka) and its pharmaceutical and therapeutical significance	1	Lecture	CAP	Knows-how	BS,L&PPT ,DIS
CO 1,CO 4,CO 6,CO 7,CO 8	Discuss and compare the significance of Murchana of Katu Taila, Tila Taila, Eranda Taila and Ghrita with special reference to analytical profile and pharmacotherapeutics	1	Lecture	CAP	Knows-how	L,L&PPT ,BL,L&G D
CO 4,CO 6,CO 7,CO 8	Identify the similarities of Sneha Kalpa with liposomal drug delivery system	1	Lecture	CC	Knows-how	BS,BL,DIS,L&PPT ,IBL
CO 4,CO 5,CO 7,CO 8	Demonstrate S.O.P for a selected Sneha Kalpa which is widely used and determine its analytical profile	6	Practical Training 22.4	PSY-GUD	Shows-how	DIS,D
CO 4,CO 7,CO 8	Analyze different stages of Sneha Paka	8	Experiential-Learning 22.3	PSY-ADT	Shows-how	DIS,TPW ,DA,LRI

M 22 Unit 4 SOP and clinical applications of Arka and Dravakam in various disorders

- 4.1. SOP for preparing selected Arkas
- 4.2. Analytical profiling of various yogas from Arka Kalpana
- 4.3. SOP of preparing various Dravakas
- 4.4. Analytical Profiling of selected formulations of Dravaka
- 4.5. Therapeutic applications and method of administration of Dravaka

References: 104,289,290,291,292,293

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 6	Describe therapeutic significance of Arka Kalpana and Dravaka	1	Lecture	CC	Knows-how	CBL,BS, DIS,PrBL

CO 7,CO 8	Discuss different distillation techniques used in pharmacy practice	1	Lecture	CC	Knows-how	L&GD,DIS,LS
CO 6,CO 7,CO 8	Elaborate Dravaka Kalpa with a critical correlation with acidic and alkaline preparations	1	Lecture	CAN	Knows-how	BL,ML,L&PPT,LS,L_VC
CO 1,CO 2,CO 6,CO 7,CO 8	Demonstrate S.O.P for the preparation of a selected Arka and Dravaka and create their analytical profile.	5	Practical Training 22.5	PSY-GUD	Shows-how	DA,LRI,D,DIS
CO 6,CO 7,CO 8	Illustrate the clinical application of selected Arka/Dravaka Kalpa	6	Experiential-Learning 22.4	PSY-MEC	Does	CBL,DIS

M 22 Unit 5 SOP and therapeutic applications of Sandhana Kalpana5.1. Different and novel fermentation techniques

5.2. SOP of preparing different types of Formulations in Sandhana Kalpana

5.3. Therapeutic applications of selected yogas from Sandhana Kalpana

References: 90,102,294,295,296,297,298,299,300,301

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 5,CO 8	Describe chemistry behind classical fermentation techniques	1	Lecture	CC	Knows-how	PrBL,DIS,CBL,BS
CO 5,CO 7,CO 8	Discuss industrial fermentation techniques	1	Lecture	CC	Knows-how	BL,DIS,L_VC,L&PPT
CO 6,CO 7,CO 8	Elaborate therapeutic significance of Sandhana kalpana	1	Lecture	CAP	Knows-how	W,DIS,CBL,PAL,L&PPT
CO 1,CO 5,CO	Demonstrate S.O.P for preparing a selected sandhana Yoga and determine the analytical	5	Practical	PSY-	Shows-	IBL,DIS,J

7	standards		Training 22.6	GUD	how	C,D
CO 4,CO 8	Perform Comparative analysis of Asava Arishta Samples having different percentage and types of sugar	5	Experiential-Learning 22.5	PSY-MEC	Does	DIS,PER,PrBL
CO 1,CO 6	Record the dose, duration, indications, and clinical outcome of the various formulation i.e.Sandhana Kalpanas in the prescribed patients.	4	Experiential-Learning 22.6	PSY-GUD	Shows-how	BS,PrBL,DIS,CBL

Practical Training Activity

Practical Training 22.1 : Demonstration of the preparation of Vati, Guggulu Kalpa, and their modified modern dosage forms

The teacher will select one formulation each from Vati and Guggulu categories. The students will prepare the selected formulations under the direct supervision of the teacher. Under the guidance of the teacher, the students will modify the selected formulation into tablet/capsule form using suitable excipients, present their observations, and discuss. Then the teacher will demonstrate the clinical utility of the prepared suppository based on pharmacological properties, classical descriptors, and the possible mode of action based on available published works.

Practical Training 22.2 : Designing an S.O.P for the preparation of Ayurvedic suppository specifying its clinical utility based on Varti Kalpana

The Teacher will select a Varti formulation and instruct the students to prepare the formulation under the direct supervision of the teacher. The students will modify the Varti into modern dosage form suppository, using suitable excipient and mould under the guidance of the teacher. Then the Teacher will demonstrate the clinical utility of the prepared suppository based on pharmacological properties, classical descriptors, and the possible mode of action based on available published works.

Practical Training 22.3 : Demonstration of the role of pharmaceutical additives and Samyak Paka of Avaleha

The teacher will assign each student to prepare an Avaleha, Paka, and Khanda Yoga and mark the critical end point based on Paka Lakshanas. The students will differentiate the Paka Lakshanas of Avaleha, Paka, and Khanda Kalpana and present their findings.

The teacher will instruct the students to assess the authenticity and genuineness of the spices and condiments used in the preparation by comparing them with the pharmacopeial standards. Then the teacher will demonstrate how the pharmaceutical additives and leha paaka influence the clinical activity based on classical descriptors and using published research works.

Practical Training 22.4 : Demonstration of S.O.P for a selected Sneha Kalpa which is widely used and determine its analytical profile

The teacher will assign each student a different Sneha Kalpa. The students will prepare the given formulation under the direct supervision of the teacher. The students will

record the findings like, temperature changes, critical end points etc.

The students will be instructed to analyze the prepared Sneha Kalpa using relevant quality control parameters and present their findings. Then the Teacher will demonstrate how the analytical profiling done matches with the pharmacopeial standards to ensure the quality of the Sneha Kalpa, which in turn will influence the clinical activity.

Practical Training 22.5 : Demonstration of S.O.P for the preparation of a selected Arka and Dravaka and create their analytical profile.

The teacher will assign each student to prepare an arka and dravaka each. The students will prepare the given products following the SOP under the direct supervision of the teacher. The teacher will instruct the students to analyse the prepared products following relevant quality control parameters. The students will carry out the analysis accordingly under the guidance of the teacher and present their observations. Then the Teacher will demonstrate how the pharmacopeial standards and classical descriptors help in determining the quality of the product, which in turn will influence the clinical activity.

Practical Training 22.6 : Demonstration of S.O.P for preparing a selected sandhana Yoga and determine the analytical standards

The Teacher will select a Sandhana Yoga (Madhura and Amla) and assign the students to prepare the given formulation following SOP under the direct supervision of the teacher. The students will analyse the product after the completion of given formulation using relevant analytical parameters, including alcohol percentage. Then the teacher will demonstrate how the percentage of alcohol is significant in post-marketing surveillance.

Note: It is expected that each batch will prepare a different Sandhana Kalpana, and the analysis will be carried out here only after the completion of fermentation.

Experiential learning Activity

Experiential-Learning 22.1 : Analysis of the role of Gugulu Kalpana in various clinical conditions by selecting a specific Gulggulu Yoga.

The Teacher will select different gugulu preparations and ask the student to select one Guggulu formulation and assign them to list the therapeutic actions of that formulation. Also, the student will analyse how the formulation is effective in those clinical conditions by analysing the possible mode of action, discussing the pharmacological activity of each ingredient, method of preparation, and published research works.

OR

The teacher will allot each student a different Vati/Guggulu Kalpa and instruct them to explore the prescriptions containing those formulations in OPD/IPD files of the Hospital. The students will note the dose, Anupana, duration of administration, clinical indication, and therapeutic outcome, present their observations, and discuss

Experiential-Learning 22.2 : Analysis of the role of selected leha yoga in different clinical conditions.

The Teacher will assign each student a particular Avaleha/Paka/Khanda Yoga, and the student will analyse how the selected Avaleha Yoga works in different clinical conditions and demonstrate the mode of action based on classical descriptors, pharmacology of individual ingredients, and published research works.

OR

The teacher will instruct each student to explore the prescription containing Avaleha/Paka/Khanda. The students will note down the dose, Anupana, duration, clinical

indication, and therapeutic outcome. They will present their findings and discuss

Experiential-Learning 22.3 : Analysis of different stages of Sneha Paka

The teacher will assign each student a different Sneha Kalpa and will ask them to carry out Sneha Paka. The students will carry out the Sneha Paka till Dagdha Paka and collect the samples at different stages of Sneha Paka (Ama, Mridu, Madhyama, Khara, and Dagdha). The students will comparatively analyse the samples of different Paka stages and present their findings. Based on the analytical parameters, therapeutic significance of the samples will be discussed.

Experiential-Learning 22.4 : Illustration of the clinical application of selected Arka/Dravaka Kalpa

The Teacher will assign different Arka/Dravaka formulations to each student. The students will explore the clinical indications of the allotted dosage form and discuss the dose, clinical application, and mechanism of action based on classical and pharmacological descriptors of the ingredients. They will refer relevant publications (case studies/case reports), present the same, and discuss.

Experiential-Learning 22.5 : Comparative analysis of Asava Arishta Samples having different percentage and types of sugar

The teacher will allot each student a different Asava/Arishta sample containing different proportions of sweetening substances and different types of sweeteners like Sharkara, Sita, Guda, madhu or their combinations. The students will analyse the given samples for alcohol percentage, total, reducing and non reducing sugars, present their findings and discuss

Experiential-Learning 22.6 :

Record the dose, duration, indications, and clinical outcome of the various formulation i.e. Sandhana Kalpanas in the prescribed patients.

The teacher will allot each student a different Sandhana Kalpa. The students will analyse the therapeutic application of the given formulation based on the pharmacological and therapeutic profile of the ingredients based on classical and modern scientific literature and relevant publications.

OR

The teacher will allot each student to explore minimum two Sandhana Kalpana in the prescription/Hospital files. The students will record the dose, duration, indications, and clinical outcome of the formulation in the prescribed patients

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The assessment will be for 75 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade

6

points

Select any three activities for 25 marks each (3 x 25 = 75 Marks):

1. Compilation work on Solid/semisolid/liquid/powder dosage forms
- 2 . Structured LAQ
3. Case-based presentation on Clinical application of Sneha Kalpa
- 4 . Debate on Amla and Madya Sandhana Kalpa
5. Interaction on common problems encountered in preparing Asva Arishta and possible solutions to the same

or

Any two practicals in converted form can be taken for assessment. (2X25 = 50 Marks)

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Semester No : 6

Module 23 : SOP and clinical applications of Churna Kalpana(Powder dosage forms)

Module Learning Objectives

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

1. Describe the unique pharmaceutical powder dosage forms explained in Ayurveda.
2. Integrate the various pharmaceutical dosage forms in Ayurveda with the modern dosage forms.
3. Evaluate the challenges in developing newer dosage forms without compromising the strength of traditional dosage forms.
4. Design and develop newer dosage forms by evaluating the chemistry of present forms for the congenial use in the present society

M 23 Unit 1 SOP and clinical utility of Churna Kalpana1.1. Standardisation of various Churna yogas with Standard Operating Procedure

- 1.2. Therapeutic application of various Churna yogas
- 1.3. Relevance of Churna kalpana in therapeutics.

References: 90,238,302,303

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 4,CO 6	Discuss the importance of particle size of different types of Churna concerning its pharmaceutical and therapeutic significance	1	Lecture	CAP	Knows-how	L&GD,L
CO 1,CO 6,CO 7	Describe the pharmacological and therapeutic significance of Churna kalpana	1	Lecture	CAP	Knows-how	DIS,L&PPT ,BL
CO 1,CO 2,CO 3	Demonstrate the SOP and quality analysis of a selected Churna yoga	5	Practical Training 23.1	PSY-GUD	Shows-how	D,JC,DA, LRI,CBL
CO 1,CO 6,CO 7,CO 8	Evaluate the role of a selected Churna in a specific clinical condition	8	Experiential-Learning 23.1	PSY-ADT	Does	DIS,PER, PBL,PrB L

M 23 Unit 2 Standardization, analytical profiling, and clinical application of Kshara 2.1. Relevance of Kshara kalpana and Kshara sutra in therapeutics
2.2.SOP of preparation of Paneeya Kshara and Pratisaraneeeya Kshara
2.3.SOP of preparation of Kshara Sutra
2.4. Analytical profiling of Kshara

References: 90,104,237,239,243,244,262,305,306,307

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 4,CO 7	Discuss Kshara Kalpana, its sources, and evaluate the chemical composition	1	Lecture	CC	Knows-how	SDL,PrB L,L&PPT
CO 1,CO 6,CO 7	Describe the therapeutic application of Paneeya Kshara and Prathisanareeya Kshara	1	Lecture	CAP	Knows-how	JC,DIS,B S,C_L,CB L
CO 1,CO 6,CO 7,CO 8	Discuss the techniques for the preparation of Kshara Sutra	1	Lecture	CC	Knows-how	L&PPT ,L,L&GD

CO 1,CO 2,CO 4,CO 5	Demonstrate the preparation of a selected Paneeya Kshara and Pratisaraneeya Kshara and their quality analysis	5	Practical Training 23.2	PSY-GUD	Does	
CO 1,CO 2,CO 6	Demonstrate the therapeutic applications of Kshara and Ksharasutra in a given selected case	8	Experiential-Learning 23.2	PSY-GUD	Shows-how	BS,DIS,P rBL,SIM, JC

M 23 Unit 3 Lavana Kalpana with special reference to pharmaceutico-analytical aspects and therapeutic attributes3.1. Standard Operating Procedures(SOP) for preparing selected formulations from Lavana Kalpana
3.2. Analytical Profiling of Lavanans
3.3. Therapeutic Applications of Selected Formulations in Lavana Kalpana

References: 90,102,274,308

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Describe salt-based formulations (Lavana Kalpa) mentioned in different texts	1	Lecture	CC	Knows-how	L&GD,L &PPT ,DIS
CO 4,CO 5,CO 8	Discuss chemical profiling and standardization of Lavana Kalpa	1	Lecture	CAP	Knows-how	DL,DA,L &PPT ,PER
CO 1,CO 6,CO 7,CO 8	Illustrate the probable mechanism of action and clinical significance of Lavana Kalpa	1	Lecture	CAP	Knows-how	JC,DIS,C _L,CBL
CO 1,CO 2,CO 4,CO 7	Demonstrate the preparation of a selected Lavana formulation following different methods and analytical profiling	5	Practical Training 23.3	PSY-GUD	Does	D,DIS
CO 1,CO 6,CO 7	Demonstrate the role of Lavana Kalpana in various clinical conditions	8	Experiential-Learning 23.3	PSY-GUD	Shows-how	PBL,CBL ,DIS

M 23 Unit 4 Satva Kalpana SOP and clinical significance4.1.SOP for preparing selected Satvas

4.2. Analytical profiling of various yogas from Satva Kalpana

4.3. Therapeutic application of Satva kalpana

References: 65,309,310

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 5	Discuss the uniqueness and pharmaceutical relevance of Satva kalpana	1	Lecture	CAP	Knows-how	BS,D,BL, CBL
CO 4,CO 5,CO 8	Discuss SOP and analytical profiling of Satva Kalpana	1	Lecture	CAN	Knows-how	DIS,BL,C BL,L&PP T ,IBL
CO 1,CO 6,CO 7	Evaluate the clinical significance of Satva Kalpana	1	Lecture	CE	Knows-how	CBL,PER ,DIS,BS, L&PPT
CO 4,CO 5,CO 8	Demonstrate the preparation of a selected Satva and perform its analytical profiling	5	Practical Training 23.4	PSY-GUD	Shows-how	DL,D
CO 6,CO 7,CO 8	Demonstrate the role of a selected satva in a specified disease condition	7	Experiential-Learning 23.4	PSY-GUD	Shows-how	DA,BS,D IS,CBL,D L

M 23 Unit 5 Therapeutic attributes of Masi Kalpana

5.1. Masi from plant and animal origin

5.2. Pharmacology of Masi

5.3. Activated charcoal in therapeutics

5.4. Clinical applications of Masi

References: 65,90,98,102,239,311,312,313,314

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO	Discuss SOP for the preparation of Masi by following different classical and advanced	1	Lecture	CS	Knows-	IBL,BS,D

5	methods				how	IS
CO 4,CO 8	Discuss the analytical profiling of Mashi Kalpas	1	Lecture	CAN	Knows-how	LRI,PrBL,PER,CBL,DIS
CO 1,CO 6	Discuss the therapeutic significance of various Masi Kalpas	1	Lecture	CC	Knows-how	BS,JC,IBL,CBL,DIS
CO 6,CO 7,CO 8	Evaluate the clinical significance of activated charcoal	1	Lecture	CAP	Knows-how	JC,L&PPT,DIS,L&GD
CO 1,CO 2,CO 4	Demonstrate the preparation of Mashi and interpret its analytical profiling	5	Practical Training 23.5	PSY-GUD	Shows-how	DIS,D,LRI,DL,DA
CO 5,CO 6,CO 8	Demonstrate pharmaceutical modification of Masi Kalpana	5	Practical Training 23.6	PSY-GUD	Shows-how	DIS,PAL,D
CO 6,CO 7,CO 8	Evaluate the Role of Malaharas as a Topical application in Skin disease,	8	Experiential-Learning 23.5	PSY-ADT	Does	CBL,BS,DIS

Practical Training Activity

Practical Training 23.1 : Demonstration of the SOP and quality analysis of a selected Churna yoga

The teacher will select different Churna Yogas according to the particle size (Sukshma churna, Yavakuta churna etc). The teacher will allot the selected Churna Kalpa to the students. The students will authenticate raw materials in the selected Yoga and will apply processing techniques like powdering, sieving using an appropriate mesh, and homogenous mixing of ingredients.

Then the students will carry out the quality analysis of the prepared Churna following appropriate organoleptic, physico-chemical, particle size estimation, and other relevant parameters under the guidance of the teacher. The findings will be compared with the pharmacopoeial standards

Practical Training 23.2 : Demonstration of the preparation of a selected Paneeya Kshara and Pratisaraneeya Kshara and their quality analysis

The teacher will assign students to collect and authenticate raw materials required for Kshara preparation. Students will apply processing techniques as per the provided SOP. Samples will be collected at the Paneeya Kshara and Pratisaraneeya Kshara stages. Under the teacher's guidance, collected samples will undergo quality testing using relevant parameters. The results will be compared with pharmacopeial standards to ensure compliance.

Practical Training 23.3 : Demonstration of the preparation of a selected Lavana formulation following different methods and analytical profiling

The teacher will select a Lavana Kalpa and instruct students to prepare the product following the standard operating procedure (SOP). A Lavana Kalpa with multiple preparation methods (e.g., Sajala and Nirjala Narikela Lavana) will be chosen. Under the teacher's guidance, students will prepare the Lavana Kalpa, record observations, present, and discuss their findings. Additionally, students will analyze the prepared Lavana Kalpa using relevant quality parameters and compare the results with pharmacopeial standards.

Alternatively, students may demonstrate the practical preparation of Lavana Kalpa to undergraduate students, as per the syllabus, under the teacher's supervision.

Practical Training 23.4 : Demonstration of the preparation of a selected Satva and performing its analytical profiling

The teacher will assign the students to collect and authenticate raw materials needed for the preparation of the selected Satva. Under the teacher's supervision, students will apply standard processing techniques for its preparation. The students will then perform various analytical tests as per pharmacopeial standards and create an analytical profile of the taken Satva.

Practical Training 23.5 : Demonstration of the preparation of Masi and its analytical profiling

The teacher will select a Masi Kalpa prepared by different methods (Antardhuma and Bahirdhuma). Students will prepare Masi using these methods as per the SOP, guided by the teacher. Under the teacher's supervision, students will analyze the prepared Masi samples using relevant quality parameters, present their findings, and discuss.

Practical Training 23.6 : Demonstration of the pharmaceutical modification of Masi Kalpana

The teacher will select a Masi Kalpa and demonstrate its modification into modern topical dosage forms, such as ointments, creams, and gels, using suitable bases and excipients. Students will observe the process and prepare the products under the teacher's supervision, then present their observations and discuss.

Experiential learning Activity

Experiential-Learning 23.1 : Evaluating the role of a selected Churna in a specific clinical condition

The teacher will allot each student a Churna yoga. The students will explore the reference, note down the classical indications. The students will analyse how each component ingredient helps in the management of said clinical condition. Also, the students will plot the possible mode of action by analysing the pharmacology, classical descriptors, dose, anupana, time of administration, Pharmacotherapeutic properties of ingredients, and their role in the mentioned disease condition and research updates.

OR

The teacher will allot each student a Churna yoga and instruct them to explore the prescriptions containing those formulations in OPD/IPD files of the Hospital. The students will record the dose, duration, indications, and clinical outcome, present their observations and discuss.

Experiential-Learning 23.2 : Clinical applications of Kshara and Ksharasutra

The teacher will allot each student a Kshara and Ksharasutra yoga. Students will explore the reference, note clinical indications, and analyze how Kshara Sutra manages conditions like Arsha and Bhagandara. They will also examine the mechanism of action of the allotted Kshara in specific disease conditions. Furthermore, students will plot the possible mode of action by analyzing pharmacology, classical descriptors, dose, anupana, administration time, pharmacotherapeutic properties of ingredients for Kshara Kalpa, and the mechanism of action of Ksharasutra in conditions like Arsha, Bhagandara, incorporating research updates.

OR

The teacher will allot each student to explore a prescription containing Kshara (oral or Pratisarana) and a Kshara Sutra yoga in OPD/IPD files of the Hospital. Students will record the dose, duration, indications, and clinical outcome, present their observations, and discuss.

Experiential-Learning 23.3 : Demonstration of role of Lavana Kalpana in various clinical conditions

The teacher will allot each student a different yoga from Lavana Kalpana. Students will explore the reference, note clinical indications, and analyze how each component ingredient contributes to managing the specified disease. They will plot the possible mode of action by analyzing pharmacology, classical descriptors, dose, anupana, administration time, pharmacotherapeutic properties of ingredients, and their role in specific diseases, incorporating research updates.

OR

The teacher will instruct the students to explore a prescription containing Lavana Kalpa, from OPD/IPD files of the Hospital. The students will record the dose, duration, indications, and clinical outcome, present their observations, and discuss.

Experiential-Learning 23.4 : Role of a selected satva in a specified disease condition

The teacher will allot each student a yoga from Satva Kalpana. Students will explore their clinical indications and plot the possible mode of action by analyzing pharmacology, classical descriptors, dose, anupana, administration time, pharmacotherapeutic properties of ingredients, and their role in specific diseases, incorporating research updates.

OR

The teacher will instruct the students to explore prescriptions containing Guduchi Satva in various clinical conditions. Students will explore such prescriptions in OPD/IPD files of the Hospital, record the dose, duration, indications, and clinical outcome, present their observations, and discuss.

Experiential-Learning 23.5 : Role of Malaharas as a Topical application in Skin disease,

The teacher will allot each student a yoga from Malahara Kalpana used as a topical application for skin diseases. Students will analyze how it helps manage skin diseases and plot the possible mode of action by analyzing pharmacology, classical descriptors, method of preparation, mode of application, pharmacotherapeutic properties of ingredients, and their role in skin disorders, incorporating research updates.

OR

The teacher will allot each student a Malahara yoga and instruct them to explore prescriptions containing those formulations in OPD/IPD files of the Hospital. Students will record the dose, duration, indications, and clinical outcome, present their observations, and discuss.

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The assessment will be for 75 marks for this module. 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 points
Select any three activities for 25 marks each (3 x 25 = 75 Marks):

- 1.MCQ
- 2.Structured LAQ
- 3.Developing SOP of pharmaceutical modification of topical dosage forms
- 4.Developing analytical parameters for the given topical dosage forms
- 5.Class presentation on clinical applications of Topical formulations
- 6.Interaction/Viva Voce

or

Any two practical in converted form can be taken for assessment. (2X25 = 50 Marks)

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

6

Module 24 : Therapeutic significance of Topical dosage forms

Module Learning Objectives

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

1. Describe the therapeutic significance of various topical dosage forms.
2. Evaluate the challenges in current topical applications of Ayurveda.

3. Design and develop novel topical dosage forms while preserving their effectiveness.
4. Integrate clinical knowledge to develop topical applications for specific areas, such as skin disorders, burns, wounds, and pain relief.
5. Access databases to develop strategies for topical applications in cosmeceuticals, with special regard to safety.

M 24 Unit 1 Ophthalmic, Otic, and Buccal dosage forms and their clinical applications1.SOP for Ophthalmic, Otic and buccal dosage forms
2.Analytical profiling of various ophthalmic, otic and buccal dosage forms
3.Therapeutic applications of ophthalmic, otic and buccal dosage forms

References: 90,102,244,262,274,315,316,317

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 5,CO 6,CO 8	Discuss classical and novel dosage forms for ophthalmic, otic, and buccal use	1	Lecture	CC	Knows-how	L&GD,L
CO 6,CO 7,CO 8	Describe therapeutic significance and clinical applications of dosage forms for ophthalmic, otic, and buccal use	1	Lecture	CAP	Knows-how	DIS,TUT, IBL,CBL, PrBL
CO 1,CO 2,CO 3	Demonstrate various Netra Kalpa and their clinical applications	3	Practical Training 24.1	PSY-GUD	Shows-how	D,BS,PrBL,DIS
CO 1,CO 5,CO 6,CO 7,CO 8	Demonstrate the role of Ayurvedic ophthalmic preparations in various eye diseases	5	Experiential-Learning 24.1	PSY-GUD	Shows-how	PBL,D-BED,PrBL, CBL

M 24 Unit 2 Standardisation of Lepa and Malahara preparations and its application in various disorders2.1 SOP for the preparation of various Lepas
2.2.Innovative approaches including Patches, Bandages, Bands
2.3.Clinical applications of Lepa and Malahara kalpa

References: 90,104,321,326

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2	Discuss classical topical dosage forms like Lepa, Malahara	1	Lecture	CC	Knows-how	L&GD,DIS
CO 5,CO 6,CO 7,CO 8	Describe novel dosage forms for topical application, along with their regulatory guidelines	1	Lecture	CAP	Knows-how	BS,JC,DIS
CO 1,CO 5,CO 7,CO 8	Prepare a novel dosage form using one of the classical lepa Yoga	4	Practical Training 24.2	PSY-GUD	Shows-how	DIS,D,DL

M 24 Unit 3 Standard Operating Procedure (SOP) for Upanaha, Dhupa, Dhumapana, and Avachurnana Kalpa and their therapeutic applications3.1.

SOP for the preparation of Upanaha, Dhupa, Avachurnana, and the evaluation of their clinical applications

3.2. Anti-microbial activity of Dhupa

3.5. Clinical application of various Dhumapana yogas

References: 237,238,239,240,243,262,322,323,324,325,326,327,328,329,330

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 2,CO 6	Discuss the therapeutic significance of Upanaha, Dhupa, Dhumapana	1	Lecture	CAP	Knows-how	L&GD,IBL,DIS,BS,PL
CO 1,CO 2,CO 3	Demonstrate the preparation of a selected Upanaha which is useful in treating Shopha	3	Practical Training 24.3	PSY-GUD	Shows-how	JC,PER,BS
CO 4,CO 5,CO 6,CO 7,CO 8	Demonstrate the role of lepa Yogas in managing various medical needs by innovative approaches	5	Experiential-Learning 24.2	PSY-ORG	Shows-how	DIS,BS,PBL,PER,PrBL
CO 6,CO 7,CO 8	Demonstrate the role of Malahara as a Topical application in Skin disease.	3	Experiential-	PSY-	Shows-	DIS,PrBL

8			Learning 24.3	MEC	how	,CBL
Practical Training Activity						
Practical Training 24.1 : Demonstration of various Netra Kalpa and their clinical applications						
The teacher will assign each student a unique Netra Kalpa to prepare under guidance. Students will then analyze its pharmacotherapeutic properties, identifying its effectiveness in eye diseases, and explain its probable mode of action based on pharmacological properties, classical descriptors, and research updates						
Practical Training 24.2 : Preparation of a novel dosage form using one of the classical lepa Yoga						
The teacher will assign the students to authenticate raw materials in the selected Yoga. Then, the students will identify the pharmacotherapeutic properties of the selected Yoga, listing its ingredients, proportion, method of preparation, dose, mode of application, and explain its probable mode of action based on pharmacological properties, classical descriptors, and available research updates. The teacher will demonstrate the conversion of Lepa into a bandage using a suitable base. The students will prepare the same following the teacher's guidelines. Pharmaceutical modification of the classical Lepa into other novel forms like cream, ointment, gel, or liniment can also be selected for practical training.						
Practical Training 24.3 : Preparation of a selected Upanaha which is useful in treating Shopha						
The teacher will assign the students to authenticate raw materials in the selected Yoga. Then, the students will identify the pharmacotherapeutic properties of the selected Yoga, which makes it effective as a bandage, and list the ingredients, proportion, method of preparation, dose, and mode of application. They will also explain the probable mode of action based on pharmacological properties, classical descriptors, and available research updates. Furthermore, students will prepare the formulation and create an analytical profile of the selected Yoga as per the Pharmacopeia standards to standardize the formulation.						
Experiential learning Activity						
Experiential-Learning 24.1 : Exploring the the role of Ayurvedic ophthalmic preparations in various eye diseases						
The teacher will allot each student a different Netra Kalpa indicated for various eye diseases. Students will analyze how each component ingredient contributes to managing the indicated eye diseases. They will plot the possible mode of action by analyzing the pharmacology, classical descriptors, mode and time of administration, pharmacotherapeutic properties of ingredients, and their role in specific eye diseases, incorporating research updates. OR The teacher will instruct the students to search for prescriptions in OPD/IPD files for different marketed eye drops. Students will record the product name, ingredients, dose, duration, indications, and clinical outcome, then present their observations and discuss.						

Experiential-Learning 24.2 : Demonstration of the role of Lepa Yogas in managing various medical needs by innovative approaches

The teacher will allot each student a selected Lepa yoga, indicated for external application in various diseases. Students will analyze how each component ingredient alleviates symptoms of the specific disease condition. They will plot the possible mode of action by analyzing pharmacology, classical descriptors, mode and medium of application, pharmacotherapeutic properties of ingredients, and discuss research updates.

Experiential-Learning 24.3 : The role of Malahara as a Topical application in Skin disease.

The teacher will allot each student a yoga from Malahara Kalpana, applicable as a topical treatment for skin diseases. Students will analyze its role in managing skin diseases and plot the possible mode of action by analyzing pharmacology, classical descriptors, method of preparation, mode of application, pharmacotherapeutic properties of ingredients, and their role in skin disorders, incorporating research updates.

OR

The teacher will allot each student to explore prescriptions containing Malahara in the OPD/IPD files of the hospital. Students will record the name, ingredients, indications, and clinical outcomes, present their observations, and discuss.

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 25 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points Select any one of the activities for 25 marks each (1 x 25 = 25 Marks): 1. The student has to develop an SOP for the modification of the given classical topical dosage form and present 2. Structured LAQ on ophthalmic dosage forms 3. Interaction/Viva voce or Any practical in converted form can be taken for assessment. (25 Marks) or Any experiential learning method in converted form can be taken for assessment (25 marks)	2

Paper No : 4 Regulatory aspects and recent trends in Ayurvedic Pharmaceutics						
Semester No : 3						
Module 25 : Artificial intelligence in drug development and Pharmacogenetics; Pharmacogenomics						
Module Learning Objectives (At the end of the module, the students should be able to) 1. Describe the role of Artificial Intelligence in drug development 2. Demonstrate the basics of machine learning and its applications 3. Discuss 3D-Printed Drug Delivery Systems Based on Natural Products 4. Justify clinical application of pharmacogenetics 5. Describe the Current status and future perspective of Pharmacogenomics						
M 25 Unit 1 Role of Artificial intelligence in drug development 1.1. Introduction to AI in drug development 1.2. AI, machine-based intelligence learning 1.3. Role of AI in Drug discovery and Drug development References: 1,2,3,4						
3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Define AI and discuss its importance in drug development	1	Lecture	CC	Knows-how	L&PPT
CO 5,CO 8	Discuss the Role of AI in Drug Discovery and Drug development with a suitable example	1	Lecture	CAP	Knows-how	L&PPT , DIS,L_V C

CO 1,CO 8	Demonstrate the basics of machine learning and its application	4	Practical Training 25.1	PSY-GUD	Shows-how	DIS,DL,PBL,PER
CO 5,CO 7,CO 8	Perform De Novo Drug Design Using Generative Models	5	Experiential-Learning 25.1	PSY-MEC	Does	DIS,BS

M 25 Unit 2 Types of software used in Artificial intelligence 2.1. Different types of software used in AI
2.2. Data mining and analysing medical records, medication management
2.3. Recent updates

References: 2,3

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 7,CO 8	Describe different types of software used in AI	1	Lecture	CK	Knows-how	L&GD
CO 5,CO 6,CO 7,CO 8	Discuss Data mining and analysing medical records, medication management, with recent updates	1	Lecture	CAP	Knows-how	L&PPT,DIS
CO 5,CO 7,CO 8	Demonstrate prediction of drug likeliness using machine learning	4	Practical Training 25.2	PSY-ORG	Does	DL

M 25 Unit 3 3D printed drug delivery system3.1 Approaches of 3D printing in current drug delivery
3.2. 3D printing in personalized drug delivery
3.3. 3D-Printed Drug Delivery Systems Based on Natural Products

References: 2,3,4

3A	3B	3C	3D	3E	3F	3G
CO 4	Describe the fundamentals and explore the materials and technology used in 3D printing	1	Lecture	CC	Knows-how	L&PPT,L_VC

CO 4,CO 6	Discuss the concept of personalised drug delivery, formulations, and natural products	1	Lecture	CAP	Knows-how	L&GD,BL,L&PPT
CO 1,CO 6,CO 8	Demonstrate different 3D printers used in the drug delivery system	4	Practical Training 25.3	PSY-MEC	Shows-how	L_VC,M L,BL
CO 5,CO 7,CO 8	Demonstrate the comparison of traditional dosage forms versus 3D printed ones regarding the structure and dissolution	4	Practical Training 25.4	PSY-ADT	Knows-how	FV,TBL,D-M
CO 5,CO 7,CO 8	Analyse ADMET properties using AI tools	6	Experiential-Learning 25.2	PSY-ADT	Shows-how	D,DL,DIS

M 25 Unit 4 Pharmacogenetics and Pharmacogenomics
 4.1. Introduction to Pharmacogenetics and Pharmacogenomics along with its importance
 4.2. Factors influencing drug response and ADE (Adverse drug events)
 4.3. Methods of pharmacogenetics testing

References: 2,3,4,5

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Appraise key concepts and terminologies and explore the role of Pharmacogenetics and Pharmacogenomics	1	Lecture	CC	Knows-how	L&PPT
CO 5,CO 6,CO 7,CO 8	Justify clinical application of pharmacogenetics, benefits, and challenges	1	Lecture	CAP	Knows-how	BS,L&GD
CO 5,CO 7,CO 8	Demonstrate how to predict Drug-Target Interaction	4	Practical Training 25.5	PSY-GUD	Shows-how	DIS,DL
CO 5,CO 7,CO 8	Identify potential adverse effects of drug candidates using dataset and tools	5	Experiential-Learning 25.3	PSY-GUD	Shows-how	PBL,DL,DIS

M 25 Unit 5 Pharmacogenomics in drug discovery 5.1. Benefits of Pharmacogenomics 5.2. Drug Repurposing 5.3. Basis of gene-drug association 5.4. Current status and future perspective of Pharmacogenomics 5.5. Ethical concern References: 1,2,3,4,5,6						
3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Discuss how pharmacogenomics data contributes to the identification and validation of drug targets	1	Lecture	CC	Knows-how	DIS,L&P PT
CO 5,CO 7,CO 8	Discuss the current status and future perspectives of pharmacogenomics, including ethical concerns	1	Lecture	CC	Knows-how	JC,DIS,L &PPT
CO 5,CO 8	Extract potential drug-disease relationship by using through Literature /data Mining	5	Experiential-Learning 25.4	PSY-MEC	Shows-how	PBL,IBL
CO 5,CO 7,CO 8	Interpret Pharmacokinetics and Toxicology Modelling using appropriate AI tools and methods	5	Experiential-Learning 25.5	PSY-MEC	Shows-how	PBL,PrB L
Practical Training Activity						
Practical Training 25.1 : Demonstration of training in the basics of machine learning and its application						
The teacher/experts in the field will give a Brief demo or guided tour of AI used cases (target identification, virtual screening)						
Practical Training 25.2 : Prediction of drug likeliness using machine learning						
Teacher/ experts will instruct/guide the scholars to load a dataset of small molecules (Ex. SMILES strings with molecular descriptors and bio-activity)						

Practical Training 25.3 : Demonstration of different 3D printers used in the drug delivery system
The teacher/expert in the field will conduct a video demonstration of 3D printers used in the drug delivery system. Students will observe, record their findings, and present for discussion
Practical Training 25.4 : Comparison of traditional dosage forms versus 3D printed ones regarding the structure and dissolution
Teacher/experts in the field will conduct a video demonstration on the Comparison of traditional dosage forms versus 3D printed ones regarding the structure and dissolution
Practical Training 25.5 : Demonstration of the prediction of Drug-Target Interaction
The teacher or expert in the field has to demonstrate Drug-Target Interaction Prediction by using tools like Swiss Target Prediction (Web-based), STITCH (Web-based, Binding DB (Database), Python + scikit-learn or Deep Purpose (for coding-based practical), etc.
Experiential learning Activity
Experiential-Learning 25.1 : Performing De Novo Drug Design Using Generative Models
Each scholar is given with different assignment and is made to experience De Novo Drug Design Using Generative Models using appropriate tools and methods. Their findings are presented to peers and discussed
Experiential-Learning 25.2 : Analysis of ADMET properties using AI tools
Each scholar is given with different drug molecule and is made to experience using pre-trained models or public web tools (Ex, Swiss ADME, pkCSM) to predict pharmacokinetic profile and compare predictions to real-world outcomes from literature
Experiential-Learning 25.3 : Identification of potential adverse effects of drug candidates using a dataset and tools
Each scholar is given with different natural drug molecule and is made to experience Side Effect Prediction following a suitable method, dataset, and tools. The outcome will be presented and discussed
Experiential-Learning 25.4 : Extraction of potential drug-disease relationship by using through Literature /data Mining
Each scholar is asked to carry out Literature Mining for Drug Repurposing using appropriate tools and methods. They are asked to use NLP to extract potential drug-disease relationships, present their findings, and discuss

Experiential-Learning 25.5 : Interpretation of Pharmacokinetics and Toxicology Modelling using appropriate AI tools and methods

Each scholar is asked to use appropriate tools and methods to experience Pharmacokinetics and Toxicology Modelling. Predicted ADMET properties are presented and discussed

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The 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.

25 marks may be allotted to any one of the following assessment methods:

1. Written Exams / Quizzes

2. Evaluate theoretical understanding and application of AI concepts in drug development.

Types:

LAQS

Short-answer or scenario-based questions

Case analysis based on data snippets or research papers

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

4

Module 26 : Pharmacology

Module Learning Objectives

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

1. Describe the basics of pharmacology, including Pharmacodynamics and pharmacokinetics
2. Describe Pharmacokinetics, therapeutic index, and drug interactions

3. Discuss the pharmacology of drugs acting on different systems, like the Central and Peripheral nervous systems
4. Describe Adverse Drug Reactions and Emergency Pharmacology

M 26 Unit 1 Introduction to Pharmacology 1.1. Introduction to Pharmacology

1.2. Pharmacodynamics

1.3. Dose-response relationship and factors influencing drug action

References: 5,6,9

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 5,CO 7,CO 8	Define and classify pharmacology and describe the principles and mechanisms of drug action, receptor theories, and classification of rece	1	Lecture	CC	Know	C_L,BS
CO 5,CO 7,CO 8	Discuss dose response relationship, and factors influencing drug action	1	Lecture	CC	Knows-how	BS,L&PP T
CO 5,CO 7,CO 8	Demonstrate pharmacological experiments using videos or simulation software	10	Practical Training 26.1	PSY-GUD	Knows-how	DIS,L&G D,D

M 26 Unit 2 Pharmacokinetics, therapeutic index, and drug interactions 2.1. Pharmacokinetics (absorption, distribution, metabolism, excretion)

2.2. Therapeutic index and combined effects of drugs

2.3. Adverse drug reaction.

2.4. Drug interactions (pharmacokinetic and pharmacodynamic)

References: 5,6,8,9

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 5,CO	Describe the basic principles of pharmacokinetics (absorption, distribution, metabolism,	1	Lecture	CAP	Knows-	

7,CO 8	excretion)				how	
CO 5,CO 6,CO 7,CO 8	Discuss therapeutic index, drug interactions, and adverse drug reactions	1	Lecture	CC	Knows-how	BL,L
CO 5,CO 7,CO 8	Demonstrate the effect of drugs on animals by simulated experiments	10	Practical Training 26.2	PSY-ADT	Knows-how	D-BED,PBL

M 26 Unit 3 Pharmacology of drugs that act on the peripheral nervous system3.1. Organization and function of ANS (Autonomic Nervous System).

3.2. Neurohumoral transmission, co-transmission, and classification of neurotransmitters.

3.3 Parasympathomimetics, Parasympatholytics, Sympathomimetics, Sympatholytics.

3.4. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

3.5 Local anesthetic agents

References: 5,6,8,9

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 6,CO 7,CO 8	Discuss the organisation and function of ANS (Autonomic Nervous System) and describe Neurohumoral transmission, co-transmission, and classification of neurotransmitters	1	Lecture	CC	Knows-how	L&PPT ,BL,PAL
CO 5,CO 6,CO 7,CO 8	Enlist Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics, Neuromuscular blocking agents, and skeletal muscle relaxants (peripheral) and Local anaesthetic agents	1	Lecture	CC	Knows-how	L&PPT
CO 5,CO 7,CO 8	Analyse the mechanism of action of drugs acting on the Cardiovascular system through a case study scenario	7	Experiential-Learning 26.1	CS	Knows-how	D,DIS,PAL,PBL

M 26 Unit 4 Pharmacology of drugs that act on the central nervous system I4.1. Neurohumoral transmission in the C.N.S. special emphasis on the importance of various neurotransmitters, like as GABA, Glutamate, Glycine, serotonin, dopamine.

4.2. General anaesthetics and pre-anaesthetics.

4.3. Sedatives, hypnotics, and centrally acting muscle relaxants.

4.4. Anti-epileptics

References:

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Describe Neurohumoral transmission in the C.N.S and illustrate General anaesthetics and pre-anaesthetics	1	Lecture	CK	Knows-how	L_VC,L&PPT
CO 5,CO 6,CO 7,CO 8	Categorize drugs into classes such as Sedatives, hypnotics, and centrally acting muscle relaxants, and discuss anti-epileptics	1	Lecture	CAP	Knows-how	BL
CO 1,CO 3	Analyse the mechanism of action of drugs acting on the respiratory system through a case study scenario	7	Experiential-Learning 26.2	PSY-MEC	Shows-how	PrBL,DIS

M 26 Unit 5 Pharmacology of drugs that act on the central nervous system II5.1. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics, and hallucinogens.

5.2. Drugs used in Parkinson's disease and Alzheimer's disease

5.3. CNS stimulants and nootropics.

5.4. Drug addiction, drug abuse, tolerance, and dependence

References: 5,6,8,9

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 6,CO 7,CO 8	Discuss Psychopharmacological agents and enlist drugs used in Parkinson's disease and Alzheimer's disease	1	Lecture	CC	Knows-how	L&PPT ,BL
CO 5,CO 7,CO 8	Differentiate CNS stimulants and nootropics, and discuss drug addiction, drug abuse, tolerance, and dependence	1	Lecture	CC	Knows-how	L&PPT ,DIS
CO 5,CO 6,CO 7,CO 8	Analyse Adverse Drug Reaction in a polypharmacy patient through a case scenario	6	Experiential-Learning 26.3	PSY-MEC	Does	PBL,CBL

CO 1,CO 5,CO 7,CO 8	Discuss Emergency Pharmacology through a case scenario of anaphylaxis management	6	Experiential-Learning 26.4	PSY-MEC	Does	PBL,CBL
Practical Training Activity						
Practical Training 26.1 : Demonstration of pharmacological experiments using videos or simulation software						
The teacher will demonstrate selected five pharmacological experiments like, study of different routes of drug administration in mice/rats, study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice, effect of drugs on ciliary motility of frog oesophagus, effect of drugs on rabbit eye, effects of skeletal muscle relaxants using rota-rod apparatus using videos or simulation software. Students will observe, discuss, and record the demonstration						
Practical Training 26.2 : Demonstrate the effect of drugs on animals by simulated experiments						
The teacher will demonstrate five selected pharmacological experiments like, effect of drugs on locomotor activity using actophotometer, anticonvulsant effect of drugs by MES and PTZ method, study of stereotype and anti-catatonic activity of drugs on rats/mice, study of anxiolytic activity of drugs using rats/mice and study of local anaesthetics by different methods. Students will observe, discuss and record the demonstration						
Experiential learning Activity						
Experiential-Learning 26.1 : Analysis of the mechanism of action of drugs acting on the Cardiovascular system through a case study scenario						
The teacher will create a case scenario of cardiovascular disease, like a 60-year-old man who presents with chest pain and is diagnosed with stable angina. His blood pressure is 160/95 mm Hg. Now, discuss the mechanism of action and rationale for using nitrates, beta-blockers, and calcium channel blockers. Students will explore the role of antihypertensive agents (e.g., ACE inhibitors, diuretics) and recognize potential drug interactions and side effects.						
Experiential-Learning 26.2 : Analysis of the mechanism of action of drugs acting on the Respiratory system through a case						
The teacher will create a case scenario of respiratory disease, such as a 28-year-old woman has a history of asthma with recurrent wheezing, and dyspnoea. She is currently experiencing an exacerbation. Now, differentiate between short-acting and long-acting bronchodilators, and explain the role of corticosteroids in asthma management. The teacher may create a case scenario of diseases pertaining to different systems for every batch.						
Experiential-Learning 26.3 : Analyse Adverse Drug Reaction in a polypharmacy patient through a case scenario						
The teacher will create a case scenario of Adverse Drug Reaction in a polypharmacy patient, supposing a 70-year-old patient who is on digoxin, furosemide, and amlodipine.						

He complains of nausea, confusion, and visual disturbances. Students will be instructed to focus on Digoxin toxicity, Electrolyte imbalances (e.g., hypokalaemia from furosemide), Pharmacokinetics in elderly patients, and will try to find out the points like factors that predispose the elderly to ADRs, management of digoxin toxicity, and lab monitoring

Experiential-Learning 26.4 : Discussion on Emergency Pharmacology through a case scenario of anaphylaxis management

The teacher will create a case scenario of an emergency condition about different systems, like the cardiovascular system, respiratory system, etc. Students will be asked to find out a first-line treatment/management for the said anaphylaxis condition

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points Select any two activities for 25 marks each (2 x 25 = 50 Marks): - Portfolio or Reflective Assignments - Encourage reflective learning on clinical experiences, pharmacology application, or adverse drug events. - Problem-Based Learning (PBL) or Case-Based Learning (CBL) Assessment - Group discussions or written summaries. - Focuses on drug selection, pharmacodynamics, and therapeutic planning OR Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential learning method in converted form can be taken for assessment (25 marks)	4

Semester No : 4

Module 27 : Network pharmacology & Reverse Pharmacology

Module Learning Objectives

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

1. Describe the concepts of Network pharmacology and reverse pharmacology
2. Discuss biological networks (protein-protein, gene-regulatory, metabolic)
3. Analyze Research methods that use traditional drugs to develop into new drug
4. Appraise different computational methods used in drug discovery, the drug discovery current scenario, and future perspectives, and relevant research updates in Network pharmacology and Reverse pharmacology.

M 27 Unit 1 Network Pharmacology 1.1. Fundamental knowledge of Network pharmacology

- 1.2. Network pharmacology concepts
- 1.3. Computational methods
- 1.4. Applications
- 1.5. Research updates on Network pharmacology

References: 10,11

3A	3B	3C	3D	3E	3F	3G
CO 7,CO 8	Define network pharmacology and differentiate it from traditional pharmacology-	1	Lecture	CK	Knows-how	DIS,L&PPT
CO 5,CO 7,CO 8	Recognize key network concepts like nodes (genes/proteins/drugs) and edges(interactions)	1	Lecture	CC	Know	BS,L&GD
CO 5,CO 7,CO 8	Describe network construction from herbal compounds	1	Lecture	CC	Knows-how	L&PPT,DIS,BL
CO 7,CO 8	Discuss and analyze Research updates on Reverse pharmacology	1	Lecture	CAN	Knows-how	L_VC,L&PPT ,JC
CO 5,CO 7,CO 8	Discuss various applications and research updates on Network pharmacology	1	Lecture	CAP	Knows-how	BS,DIS,JC
CO 5,CO 7,CO 8	Demonstrate network pharmacology applications with the help of a video	10	Practical Training 27.1	PSY-GUD	Shows-how	DIS,L_VC,D

CO 5,CO 7,CO 8	Practice Network Pharmacology	10	Experiential-Learning 27.1	PSY-MEC	Does	PrBL,CBL
CO 5,CO 7,CO 8	Carry out a mini-project on network pharmacology	3	Experiential-Learning 27.2	PSY-MEC	Does	PrBL

M 27 Unit 2 Reverse Pharmacology 2.1. Introduction, Definition of Reverse Pharmacology, History, and Scope
 2.2. Drug Discovery Current Scenario, Challenges, and Future Perspective
 2.3. Reverse pharmacology for herbal drug-based modern medicines
 2.4. Research updates on Reverse pharmacology

References: 10,11,12,13

3A	3B	3C	3D	3E	3F	3G
CO 7,CO 8	Describe the definition and history of reverse pharmacology and discuss its Scope	1	Lecture	CC	Knows-how	BL,DIS
CO 5,CO 7,CO 8	Elaborate current scenario, challenges, and future perspectives of reverse pharmacology	1	Lecture	CC	Knows-how	DIS,BS
CO 1,CO 5,CO 6,CO 7,CO 8	Assess how reverse pharmacology leverages traditional medicine and clinical experience to accelerate drug development	1	Lecture	CC	Knows-how	BS,L&GD
CO 5,CO 6,CO 7,CO 8	Apply Reverse pharmacology for herbal-based modern medicines	1	Lecture	CAP	Knows-how	L&GD,BL
CO 5,CO 7,CO 8	Discuss and analyze Research updates on Reverse pharmacology	1	Lecture	CAN	Knows-how	JC,DIS,BL
CO 5,CO 7,CO 8	Demonstrate reverse pharmacology applications with the help of a video	10	Practical Training 27.2	PSY-GUD	Shows-how	DIS,D

CO 5,CO 7,CO 8	Present observations of analysis of Reverse Pharmacology in selected cases.	10	Experiential-Learning 27.3	PSY-MEC	Shows-how	PrBL,CBL
CO 7,CO 8	Validate Reverse pharmacology with a systems biology approach	3	Experiential-Learning 27.4	PSY-MEC	Shows-how	DIS,PrBL

Practical Training Activity

Practical Training 27.1 : Demonstration of network pharmacology applications with the help of a video

The teacher will select a drug and demonstrate network pharmacology applications of the selected drug, with the help of a video demonstration, covering topics like polypharmacology, biological networks, computational approaches, drug repurposing, and systems pharmacology. The students will observe and record findings

Practical Training 27.2 : Demonstration of reverse pharmacology applications with the help of a video

The teacher will select a drug and demonstrate reverse pharmacology applications of the selected drug, with the help of a video demonstration including the steps (1 hour for each step) like, Bioactivity Screening, Target Identification, Mechanism of Action Studies, Systems Biology, Clinical Observations, Computational Modelling, Animal Models, Safety and Toxicity Assessment, Ethnopharmacology and Phytochemical Analysis

Experiential learning Activity

Experiential-Learning 27.1 : Practice of Network Pharmacology

The teacher will give each student selected hands-on activities and approaches in network pharmacology that can involve a variety of hands-on activities and approaches that help deepen understanding of drug interactions, mechanisms of action, and the overall pharmacological landscape.

The activities can be,
simulation exercises

OR,

field trips,

OR,

interdisciplinary Workshops

OR,

Online Courses and MOOCs.

The student will perform/attend one or more activities spanning not less than 10 hours. After learning, students will present their experience and discuss	
Experiential-Learning 27.2 : A mini-project on network pharmacology	
The teacher will allot each student a different herb. Students will be asked to select a major pharmacological activity of the given herb and follow a systems biology approach to validate reverse pharmacology. After the completion of the project, students will present the outcomes and discuss	
Experiential-Learning 27.3 : Presentation of observations of analysis of Reverse Pharmacology in selected cases.	
The teacher will allot each student selected hands-on activities and approaches in reverse pharmacology, which may involve practical, hands-on experiences that enhance understanding of drug discovery and development through observation and participation. Any of the selected activities, such as laboratory rotations, case studies, mini-projects, field research, internships, collaborative projects, workshops, and seminars, spanning not more than 10 hours, can be selected. After learning, students will present their observations and discuss	
Experiential-Learning 27.4 : Interpret Reverse pharmacology with a systems biology approach.	
The teacher will allot each student a different herb. Students will be asked to select a major pharmacological activity of the given herb and follow a systems biology approach to validate reverse pharmacology. After the completion of the project, students will present the outcomes and discuss	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. 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 points Select any two activities for 25 marks each (2 x 25 = 50 Marks): 1. Assessment for network pharmacology (25 marks) Group Project: Herb–Compound–Target–Disease Network Teams research an herbal formulation and present a network pharmacology analysis Assessment on research depth, network interpretation, teamwork, and presentation skills 2. Assessment for reverse pharmacology (25 marks) Case Study Review Analyse a real-world example where reverse pharmacology led to a drug or	4

Assess understanding of reverse pharmacology steps: clinical observations ? lab validation, ? mechanistic studies

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Module 28 : Pharmaceutical Quality Assurance

Module Learning Objectives

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

1. Describe Quality Assurance and Quality Management concepts
2. Explain Personnel Responsibilities
3. Discuss types of Containers, Packing materials
4. Discuss Good Laboratory Practices
5. Justify document maintenance in the pharmaceutical industry

M 28 Unit 1 Quality Assurance and Quality Management concepts

- 1.1. Introduction to Quality Assurance and Quality Management concepts
- 1.2. Definition and concept of Quality control,
- 1.3. Quality assurance and GMP
- 1.4. Total Quality Management (TQM)
- 1.5. ICH Guidelines
- 1.6. Brief overview of Pharmaceutical industry guidelines for Quality, Safety, Efficacy and Multidisciplinary (QSEM)
- 1.7. Overview of ISO 9000 & ISO14000
- 1.8. Steps for registration of NABL accreditation

References: 16,17,18

3A	3B	3C	3D	3E	3F	3G
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CO 4,CO 5,CO 8	Define and elaborate the concept of Quality Assurance and Quality Management as per GMP	1	Lecture	CC	Knows-how	L&GD
CO 4,CO 5,CO 8	Describe Total Quality Management (TQM) and ICH Guidelines, QSEM, and ISO 9000 & ISO14000	1	Lecture	CC	Knows-how	DIS
CO 5,CO 7,CO 8	Illustrate the Steps for registration of NABL accreditation	1	Lecture	CAP	Knows-how	L&PPT
CO 4,CO 5,CO 8	Demonstrate the process of mock GMP Inspection	5	Practical Training 28.1	PSY-GUD	Shows-how	DIS,D
CO 4,CO 8	Demonstrate GMP Hierarchy and Responsibilities	5	Practical Training 28.2	PSY-GUD	Shows-how	D
CO 4,CO 7,CO 8	Identify the Root cause, affected personnel roles, and suggest corrective and preventive measures through Case Study Discussion on GMP Violation	6	Experiential-Learning 28.1	PSY-GUD	Shows-how	CBL

M 28 Unit 2 Personnel Responsibilities2.1. Organization and personnel

2.2. Personnel responsibilities, training, hygiene, and personal records.

2.3. Premises: Design, construction, and plant layout, maintenance, sanitation, environmental control, utilities, and maintenance of sterile areas, control of contamination.

2.4. Equipment and raw materials: Equipment selection, purchase specifications, maintenance, and purchase specifications and maintenance of stores for raw materials.

References: 15,16,18

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 7,CO 8	Describe Organizational structure and personnel management	1	Lecture	CC	Knows-how	BS,L&PPT
CO 4,CO 7,CO 8	Discuss design, construction, and maintenance of Premises	1	Lecture	CC	Knows-how	DIS,L_V C,L&PPT

CO 4,CO 7,CO 8	Document a personal record of pharmacy personnel	6	Experiential-Learning 28.2	PSY-ADT	Shows-how	BL,CBL,PrBL
M 28 Unit 3 Containers, Packing materials 3.1. Types of Packaging 3.2. Packaging materials 3.3. Container types and closures 3.4. Packaging and stability 3.5. Regulatory aspects 3.6. Quality Control 3.7. Smart Packaging References: 14,15,16						
3A	3B	3C	3D	3E	3F	3G
CO 4,CO 7,CO 8	Discuss selection and maintenance of equipment, purchase specifications of raw materials, and maintenance of stores	1	Lecture	CC	Knows-how	SDL,L_VC,DIS,PER,L&PPT
CO 4,CO 7,CO 8	Discuss Types of containers and packaging, Regulatory aspects, their Quality Control, and Smart Packaging	1	Lecture	CC	Knows-how	L&PPT,L_VC
CO 4,CO 7,CO 8	Demonstrate the identification and Classification of packaging materials	5	Practical Training 28.3	PSY-GUD	Shows-how	DIS,D
CO 4,CO 5,CO 8	Inspect Packaging Materials to check their compliance with quality specifications	6	Experiential-Learning 28.3	PSY-MEC	Does	PrBL
M 28 Unit 4 Good Laboratory Practices 4.1. GLP Principles and Requirements 4.2. GLP documentation 4.3. Regulatory compliance						

4.4. Audit procedures

References: 16,18

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 5,CO 8	Elaborate GLP with its Principles and Requirements, documentation, Regulatory compliance, Audit procedures	1	Lecture	CK	Know	L&PPT
CO 4,CO 5,CO 8	Demonstrate SOP Writing for different equipment	5	Practical Training 28.4	PSY-GUD	Shows-how	D,DL
CO 4,CO 5,CO 7,CO 8	Perform calibration of Analytical Instruments	2	Experiential-Learning 28.4	PSY-MEC	Does	CBL,PrBL

M 28 Unit 5 Document maintenance in pharmaceutical industry

4.1. Documentation related to Grievances and Redressal

4.2. Complaints and evaluation of complaints, Handling of returned goods, recalling, and waste disposal.

4.3. Document maintenance in the pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review, Quality documentation, Reports and documents, distribution records.

References: 14,15,16,18

3A	3B	3C	3D	3E	3F	3G
CO 1,CO 4,CO 8	Define Complaints, their evaluation, product recall, and waste disposal	1	Lecture	CC	Knows-how	BS,L&GD
CO 4,CO 8	Describe document maintenance in the pharmaceutical industry	1	Lecture	CAP	Knows-how	DIS,D,L &PPT
CO 4,CO 5,CO 8	Conduct QA Documentation audit	6	Experiential-Learning 28.5	PSY-MEC	Does	PrBL

Practical Training Activity
Practical Training 28.1 : Demonstration of the process of mock GMP Inspection
The teacher will demonstrate the process of a mock GMP inspection by assigning different roles to the students, as QA officers and pharmacy personnel. The students will perform audits, check documentation, cleanliness, personnel hygiene, equipment logs etc
Practical Training 28.2 : Demonstration of GMP Hierarchy and Responsibilities
The teacher will demonstrate GMP Hierarchy and assign Responsibilities, such as Quality Assurance (QA), Quality Control (QC), Production, Warehousing, Maintenance, Regulatory Affairs, Top Management, etc, to each student. The students will present their responsibilities, experiences, and challenges
Practical Training 28.3 : Demonstration of Identification and Classification of Packaging Materials
The teacher will demonstrate a range of containers and packaging samples (e.g., glass bottles, blisters, plastic containers, aluminum foil, cartons) to the students, and the students will classify them as primary or secondary packaging and identify material type (HDPE, glass, PVC, etc.) and Record suitability for different dosage forms
Practical Training 28.4 : Demonstration for SOP Writing of different equipment
The teacher will demonstrate SOP for an equipment or a lab process (e.g., pH measurement, reagent preparation), and the students will be asked to write a Standard Operating Procedure (SOP) of the demonstrated instrument
Experiential learning Activity
Experiential-Learning 28.1 : Identification of the Root cause, affected personnel roles, and suggest corrective and preventive measures through Case Study Discussion on GMP Violation
The teacher will create a case scenario of GMP Violation due to Poor Personnel Management. The students will be provided with a real or fictional GMP warning letter or case study involving personnel errors. The students will identify the Root cause, affected personnel roles, and suggest corrective and preventive measures
Experiential-Learning 28.2 : Documentation of a personal record of pharmacy personnel

The teacher will ask the students to create a mock record of an employee of the pharmacy, and it will be cross-checked by another student for errors	
Experiential-Learning 28.3 : Inspection of Packaging Materials to check their compliance with quality specifications	
The teacher will give mock purchase orders, specification sheets, and provide some packaging material samples (some compliant, some defective). The students will inspect the materials, match them against specifications (dimensions, clarity, print quality), and approve or reject with reasons	
Experiential-Learning 28.4 : Calibration of Analytical Instruments	
The students will perform the calibration of different analytical instruments, pH meter, an Analytical balance, UV-Vis spectrophotometer	
Experiential-Learning 28.5 : QA Documentation audit	
The teacher will allot each student mock documents like Batch Manufacturing Records (BMR), deviations, Change control forms, etc. The students will audit the given documents for errorsapprove/reject documentation and justify their decisions	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. 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 Select any two activities for 25 marks each (2 x 25 = 50 Marks): Open Book Case Study Analysis Activity: Provide a GMP violation case (e.g., FDA 483 or WHO notice). Students answer: What went wrong in QA/QMS? How could it be prevented? What documents/systems failed? OR Simulation-Based Practical Assessment Examples:	4

Review a mock Batch Manufacturing Record for errors

Conduct a mock audit using a checklist

Respond to a deviation report

OR

Group Presentation or Poster Making

Topics Could Include:

Elements of a Quality Management System

Lifecycle of a deviation report

“Quality by Design” and its role in GMP

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

Semester No : 5

Module 29 : Pharmacy Practice

Module Learning Objectives

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

1. Describe the Hospital Pharmacy and the Community Pharmacy with their organization
2. Discuss Therapeutic Drug Monitoring
3. Discuss the Pharmacy and Therapeutic Committee
4. Enlist the emergency drug list

M 29 Unit 1 Hospital Pharmacy and Community Pharmacy1.1. Hospital and its organization

- 1.2. Definition, Classification of Hospital
- 1.3. Hospital pharmacy and its organization
- 1.4. Functions of hospital pharmacy
- 1.5. Community Pharmacy
- 1.6. Organization and structure of retail and wholesale drug stores

References: 19,20

3A	3B	3C	3D	3E	3F	3G
CO 7,CO 8	Define and classify Hospital Pharmacy, and discuss its organization	1	Lecture	CC	Know	L
CO 5,CO 7	Describe Community Pharmacy	1	Lecture	CC	Knows-how	L&PPT, PAL, RLE
CO 7,CO 8	Discuss the Organization and structure of retail and wholesale drug stores	1	Lecture	CC	Knows-how	L&PPT, IBL, DIS
CO 6,CO 7	Demonstrate Drug Information and Case Analysis	5	Practical Training 29.1	PSY-GUD	Shows-how	D
CO 6,CO 7	Demonstrate Prescription Handling and Dispensing	5	Practical Training 29.2	PSY-GUD	Shows-how	DIS, L, D
CO 5,CO 6,CO 7,CO 8	Identify Adverse drug reaction in selected case.	7	Experiential-Learning 29.1	PSY-GUD	Shows-how	CBL, DIS
CO 6,CO 7	Appraise about Basic Health Screening at community setup	6	Experiential-Learning 29.2	PSY-MEC	Does	DIS, RLE, PrBL

M 29 Unit 2 Therapeutic Drug Monitoring 2.1. Drug distribution system in a hospital 2.2. Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, dispensing of drugs to ambulatory patients, and dispensing of controlled drugs. 2.3. Hospital formulary 2.4. Therapeutic drug monitoring 2.5. Factors to be considered during the Therapeutic Drug Monitoring 2.6. Medication adherence 2.7. Patient medication history interview 2.8. Community pharmacy management 2.9. Financial, materials, staff, and infrastructure requirements.						
References: 19,20						
3A	3B	3C	3D	3E	3F	3G
CO 6,CO 7,CO 8	Describe the Drug distribution system in a hospital	1	Lecture	CAP	Knows-how	L&PPT ,L&GD
CO 6,CO 7	Discuss Dispensing of drugs to inpatients, types of drug distribution systems, charging policy, and labelling, dispensing of drugs to ambulatory patients, and dispensing of controlled drugs	1	Lecture	CAP	Knows-how	DIS,CBL, BS
CO 6,CO 7	Discuss about Hospital formulary and Therapeutic drug monitoring	1	Lecture	CC	Knows-how	CD,W,CBL,DIS
CO 5,CO 6,CO 7	Evaluate Medication Adherence	1	Lecture	CE	Knows-how	Mnt,CBL, PBL
CO 5,CO 7,CO 8	Analyse Financial, materials, staff, and infrastructure requirements	1	Lecture	CAP	Knows-how	EDU,DIS, BS
CO 7,CO 8	Perform Data Interpretation & Pharmacokinetic Calculations	5	Practical Training 29.3	PSY-GUD	Shows-how	D,CBL

CO 5,CO 6,CO 7,CO 8	Discuss Multidisciplinary Integration for Therapeutic Drug Monitoring	7	Experiential-Learning 29.3	PSY-ADT	Shows-how	FV,DIS,I BL
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M 29 Unit 3 Pharmacy and therapeutic committee 3.1. Introduction to Pharmacy and Therapeutic Committee
3.2. Drug information services

References: 19,20,21,22

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Describe Pharmacy and Therapeutic Committee along with Drug Information Services	1	Lecture	CC	Knows-how	L&PPT ,SDL
CO 6,CO 7,CO 8	Enlist emergency drugs used in pharmacy	1	Lecture	CC	Knows-how	CBL,L&GD,DIS,BS
CO 5,CO 7,CO 8	Demonstrate Formulary Review and Management	5	Practical Training 29.4	PSY-GUD	Shows-how	D,DIS
CO 6,CO 7,CO 8	Appraise and Develop Standard Therapeutic Guidelines	6	Experiential-Learning 29.4	PSY-ORG	Does	CBL,PrBL,PBL,RLE

Practical Training Activity

Practical Training 29.1 : Drug Information and Case Analysis

The teacher will demonstrate a systematic approach to drug information queries using primary, secondary, and tertiary sources. The teacher will interpret lab reports to optimize drug therapy in real patient cases.

Practical Training 29.2 : Prescription Handling and Dispensing

The teacher will demonstrate Prescription Handling, including legal compliance, checking for completeness, and identifying potential drug-drug interactions.

Practical Training 29.3 : Data Interpretation and Pharmacokinetic Calculations
The teacher will select a formulation and demonstrate pharmacokinetic formulas, including volume of distribution, clearance, elimination constant, half-life, and calculation of loading and maintenance doses using nomograms and tailored regimens
Practical Training 29.4 : Formulary Review and Management
The teacher will demonstrate selected case-based drug monographs, including discussion of cost, efficacy, and safety, with examples. The students will follow the guidelines and review different monographs and present.
Experiential learning Activity
Experiential-Learning 29.1 : Identification of Adverse drug reaction in selected case and .documentation cases of Adverse Drug Reaction
The students will be posted in the hospital. They will document a minimum of 10 patient cases concerning anupana, sahapana, pathya-apathya, kala maryada, and ADRs, if any. They may also document the cases retrieved from Hospital records.
Experiential-Learning 29.2 : Experience about Basic Health Screening at community screening
Students will perform hands-on tests using community pharmacy equipment in a community setting, on a minimum of 10 patients, including measurements of blood pressure using a sphygmomanometer, capillary blood glucose using a glucometer, lung function using a peak flow meter and incentive spirometer, pulse oximetry to measure SPO ₂ , and BMI assessment
Experiential-Learning 29.3 : Discuss on Multidisciplinary Integration for TDM(Therapeutic Drug Monitoring) decision making
Students will interact with clinicians and laboratory personnel, communicating Therapeutic Drug Monitoring (TDM) recommendations, discussing laboratory results, and planning monitoring strategies. Additionally, students will conduct case-based ward rounds, incorporating lab values, patient status, and polypharmacy considerations into TDM decision-making.
Experiential-Learning 29.4 : Development of Standard Therapeutic Guidelines
Students will draft protocols for common conditions, such as hypertension, based on evidence-based medicine. These protocols will undergo peer review by a committee, which will evaluate and refine the guidelines before their formal adoption.
Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade points Select any two activities for 25 marks each (2 x 25 = 50 Marks): Any two of the following: 25X02 1. Competency assessments 2. Surveys 3 . Structured peer feedback 4 . Structured LAQ/SAQ 5. Portfolio OR Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential learning method in converted form can be taken for assessment (25 marks)	4
Module 30 : Pharmaceutical Microbiology	
Module Learning Objectives (At the end of the module, the students should be able to) 1. Describe microbes with applications of sterilization 2. Discuss Sources of Contamination 3. Analyze types of spoilage and justify use of antimicrobial agents	
M 30 Unit 1 Introduction to microbes with applications of sterilization 1.1. Identification of bacteria using staining techniques (simple, Gram's & Acid-fast staining) and biochemical tests (IMViC). 1.2. Study of principles, procedures, merits, demerits, and applications of physical, chemical, gaseous, radiation, and mechanical methods of sterilization. 1.3. Evaluation of the efficiency of sterilization methods.	

1.4. Equipment employed in large-scale sterilization and Sterility indicators

References: 23,24,25,26,27

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 5,CO 7,CO 8	Define and classify microorganisms (microbes) and explain their general characteristics	1	Lecture	CC	Know	L&PPT ,L_VC
CO 5,CO 7,CO 8	Discuss the beneficial and harmful roles of microbes in health, industry, and the environment	1	Lecture	CAP	Knows-how	DIS,L&PPT ,L&GD,L_VC
CO 4,CO 5,CO 7,CO 8	Describe the concept of sterilization, its importance, and differentiate various sterilization methods	1	Lecture	CC	Knows-how	CBL,L&PPT ,L&GD,L_VC, PL
CO 5,CO 7,CO 8	Demonstrate dry heat sterilization method	3	Practical Training 30.1	PSY-GUD	Shows-how	DIS,DL,D
CO 5,CO 7,CO 8	Conduct dry heat sterilization	6	Experiential-Learning 30.1	PSY-GUD	Shows-how	PrBL

M 30 Unit 2 Sources of contamination2.1. Designing an aseptic area.

2.2. Study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

2.3. Principles and methods of different microbiological assay methods.

References: 23,24,25,26,27

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 5,CO 7,CO 8	Define contamination and explain its significance in aseptic and cleanroom environments	1	Lecture	CC	Knows-how	BS,DIS

CO 4,CO 5,CO 7,CO 8	Recognise common sources of contamination in pharmaceutical and microbiological settings and discuss how each source contributes to microbial and particulate contamination	1	Lecture	CAP	Knows-how	PrBL,BS, L&PPT ,PBL
CO 5,CO 7,CO 8	Discuss the impact of contamination and describe methods used to minimize or prevent contamination	1	Lecture	CC	Knows-how	L&GD,B L,DIS,BS ,L&PPT
CO 4,CO 7,CO 8	Discuss the principles and methods of different microbiological assay methods	1	Lecture	CAP	Knows-how	L&PPT ,P AL,L_VC
CO 4,CO 5,CO 7,CO 8	Demonstrate the Aseptic Technique Practice for the transfer of microbes	2	Practical Training 30.2	PSY-GUD	Shows-how	D,DL
CO 4,CO 5,CO 7,CO 8	Perform Simulation Activity for Aseptic Practices	6	Experiential-Learning 30.2	PSY-ADT	Does	PrBL,DIS ,EDU,RP, GBL

M 30 Unit 3 Types of spoilage and use of antimicrobial agents3.1. Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, assessment of microbial contamination and spoilage.
3.2. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations

References: 23,24,25,26,27

3A	3B	3C	3D	3E	3F	3G
CO 4,CO 7,CO 8	Define spoilage, explain its significance in pharmaceuticals, food, and cosmetics, and discuss the factors that contribute to spoilage	1	Lecture	CC	Knows-how	DIS
CO 4,CO 7,CO 8	Describe the signs of spoilage	1	Lecture	CC	Knows-how	L&PPT ,BL
CO 4,CO 7,CO 8	Classify different types of antimicrobial agents (e.g., preservatives, disinfectants, antibiotics) based on their mode of action and explain their antimicrobial mechanisms	1	Lecture	CAP	Knows-how	PER,L&P PT ,BL

CO 4,CO 7,CO 8	Demonstrate Personnel Contamination Assessment	7	Practical Training 30.3	PSY-GUD	Shows-how	D,DL,DIS
CO 4,CO 7,CO 8	Demonstrate Different Types of Spoilage	8	Practical Training 30.4	PSY-GUD	Shows-how	D,DL,DIS
CO 4,CO 7,CO 8	Conduct Real-life case studies on spoilage outbreaks and preservative failures	7	Experiential-Learning 30.3	PSY-MEC	Does	PBL,CBL,DIS,PrBL
CO 4,CO 7,CO 8	Observe and detect Spoilage of Pharmaceutical Product in Real Time	7	Experiential-Learning 30.4	PSY-ADT	Does	PrBL,PBL

Practical Training Activity

Practical Training 30.1 : Demonstration of dry heat sterilization method

The teacher will select glassware contaminated with microbes based on the swab test and demonstrate the sterilization of the contaminated glassware using dry heat. The teacher will then demonstrate sterility testing of the glassware after dry heat sterilization. Additionally, the teacher will compare dry heat with moist heat (autoclaving) methods, discussing their applications and limitations. Students will observe the demonstration and then perform the dry heat sterilization process independently as part of experiential learning.

OR

A video demonstration of the dry heat sterilization method will be arranged. The students will observe the video, record the findings, present the same, and discuss

Practical Training 30.2 : Demonstration of Aseptic Technique Practice for the transfer of microbes

The teacher will demonstrate proper aseptic techniques, including the use of sterile gloves, flame sterilization, and safe working practices near a Bunsen burner or in a laminar flow cabinet. The teacher will also demonstrate the aseptic transfer of microbes from one medium to another.

OR

A video demonstration of the aseptic technique practice in the microbiology lab will be arranged. The students will observe the video, record the findings, present the same, and discuss

Practical Training 30.3 : Demonstration of Personnel Contamination Assessment

The teacher will demonstrate how personnel can be a source of contamination. Student volunteers will be asked to press their unwashed hands onto nutrient agar plates. The results will be compared with plates touched after hand washing or sanitizing. The plates will be incubated, and the differences in colony growth will be observed. The teacher will then explain the critical role of hand hygiene in contamination control.

OR

A video demonstration on personnel contamination assessment in a laboratory setting will be arranged, showcasing proper attire, hand hygiene, and awareness of potential contamination sources. Students will observe the video, record their findings, and participate in a class discussion.

Practical Training 30.4 : Demonstration of Different Types of Spoilage

The teacher will display spoiled food or pharmaceutical preparations. The teacher will then demonstrate the examination of food samples (e.g., bread, milk, fruit juice) or pharmaceutical preparations stored under different conditions (room temperature, refrigerated, exposed to air). Students will be instructed to note changes such as discoloration, mold growth, gas bubbles, off-odors, and texture changes. Over several days, students will record their observations and understand how microbial spoilage manifests physically and chemically.

Experiential learning Activity

Experiential-Learning 30.1 : Conduction of Dry heat sterilization practice

Each student will be assigned an article contaminated with microbes. The students will then sterilize the articles using the dry heat method in a hot air oven. After sterilization, students will test for sterility by inoculating the nutrient broth and observing for growth. The recorded findings will be presented and discussed.

Experiential-Learning 30.2 : Simulation Activity for Aseptic Practices

The students will simulate activities such as preparing sterile media, gowning, and handling materials in an aseptic area. Peers will observe and provide feedback on potential contamination risks. The students will then discuss how behaviour and protocols can reduce contamination risks.

Experiential-Learning 30.3 : Real-life case studies on spoilage outbreaks and preservative failures

The teacher will assign each student a spoiled food item, a pharmaceutical preparation, or a scenario. Students will then identify the type of spoilage, determine the probable cause of the spoilage, and suggest ways in which contamination could have been prevented.

Experiential-Learning 30.4 : Observing and detecting Spoilage of Pharmaceutical Product in Real Time

The teacher will provide each student with two samples of the same dosage form (one fresh and one old) of a pharmaceutical product, such as Panchavidha Kashaya

Kalpana, and their suitable Upakalpana. Students will then assess both samples for spoilage using organoleptic and basic physicochemical parameters. They will record their observations on the comparative stability of the fresh and old samples. By applying theoretical knowledge to practical scenarios, students will highlight the importance of microbial limit tests in quality control of pharmaceutical products.

Modular Assessment

Assessment method

Hour

Conduct a structured Modular assessment. The assessment will be for 50 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point

Select any two activities for 25 marks each (2 x 25 = 50 Marks):

- LAQ/SAQ/MC- 25 Marks
- Viva Voce – Oral exam covering lab work, techniques, and basic theory- 25 Marks

OR

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

and

Any experiential learning method in converted form can be taken for assessment (25 marks)

4

Semester No : 6

Module 31 : Regulatory Acts and Rules applicable to Ayurvedic Drugs

Module Learning Objectives

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

1. Describe the provisions of the Drugs and Cosmetics Act, 1940, and Rules, 1945, as applicable to ASU drugs.
2. Identify the roles and responsibilities of regulatory authorities
3. Describe the penalties and offences related to non-compliance.
4. Discuss the key aspects of other relevant acts, including the Narcotic Act, Pharmacy Act, and Drug and Magic Remedies Act.

M 31 Unit 1 Chapter I of the Drugs and Cosmetics Act, 1940 and Rules 1945 1.1.Introduction to 'Drugs and Cosmetic Act, 1940; and 1945' and definitions
1.2. Prescribed Books on Ayurveda, Siddha, and Unani Drugs: The First Schedule

References: 28,29

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Describe the Scope and Applicability of the Drugs and Cosmetics Act and Key Definitions	1	Lecture	CC	Knows-how	JC
CO 5,CO 8	Discuss the Legal importance of Drug Regulation and enlist prescribed books of ASU from the first Schedule of D&C Act	1	Lecture	CC	Knows-how	JC,PER,T PW
CO 5,CO 8	Analyse case law on the Factory Act	4	Experiential-Learning 31.1	PSY-MEC	Does	CBL,DIS, BS,PrBL

M 31 Unit 2 Chapter II - Regulatory Bodies2.1. The Drugs Technical Advisory Board (DTAB)
2.2. The Central Drugs Laboratory (CDL)
2.3.The Drugs Consultative Committee (DCC)

References: 28,29

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Identify key regulatory authorities and develop foundational knowledge of regulatory frameworks	1	Lecture	CC	Knows-how	DIS,L&P PT
CO 5,CO 8	Record their observations regarding hypothetical issue through Mock composition exercise of demonstration of the roles of DTAB (Drug Technical Advisory Board) composition, including representatives from DGHS, DCGI, pharmacologists	4	Practical Training 31.1	PSY-GUD	Shows-how	RLE,RP, BS
CO 5,CO 8	Prepare a technical report on Adverse Drug Reactions (ADRs) for submission to DTAB	4	Experiential-	PSY-	Does	EDU,D

			Learning 31.2	MEC		
M 31 Unit 3 Chapters III, IV, and IV-A - Regulation of Drugs and Cosmetics 3.1. Chapter III: Standards of quality 3.2. Misbranded, adulterated, and spurious drugs and cosmetics 3.3. Prohibition of import of certain drugs or cosmetics 3.4. Manufacturing, Labelling, and Sale of Drugs and Cosmetics (Chapter IV-A) 3.5. Standards of quality for drugs and cosmetics (Sections 16 and 16A) 3.6. Prohibition of manufacture and sale of certain drugs and cosmetics (Sections 18 and 19) References: 28,29						
3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Summarize the provisions of Chapter III regarding the import of drugs and cosmetics into	1	Lecture	CAP	Know	L&PPT , BL,L&G D
CO 5,CO 8	Identify legal restrictions and prohibitions for misbranded and spurious drugs and	1	Lecture	CC	Knows-how	C_L,SDL, CBL
CO 5,CO 8	Describe manufacturing, labelling, and sale provisions, including penalties and seizures (Chapter IV-A)	1	Lecture	CC	Knows-how	BS,PL,PB L
CO 5,CO 8	Justify the importance of standards of quality for drugs and cosmetics (Sections 16 and 16A)	1	Lecture	CC	Knows-how	L&PPT ,P ER,L&G D
CO 5,CO 8	Discuss the prohibition of the manufacture and sale of certain drugs and cosmetics	1	Lecture	CC	Knows-how	BS,DIS
CO 5,CO 8	Prepare mock import license applications	4	Practical Training 31.2	PSY-GUD	Shows-how	DIS,BS,E DU,D
CO 5,CO 8	Demonstrate case scenarios of misbranded/spurious drugs and cosmetics	5	Practical	PSY-	Shows-	CBL,DIS,

			Training 31.3	GUD	how	D
CO 5,CO 8	Identify misbranded and spurious drugs/cosmetics	4	Experiential-Learning 31.3	PSY-MEC	Does	CBL,BS,PBL,PrBL

M 31 Unit 4 Schedules to Drugs and Cosmetics Rules related to ASU drugs and cosmetics4.1. Good Manufacturing Practices (GMP) for ASU Medicines (Schedule T) and Poisonous Substances (Schedule E(1))

4.2. Prescription and Safety Requirements (Schedules H, G, X) and Pharmacological Information (Schedule Y)

References:

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Discuss the provision of Schedule T and Schedule E (1)	1	Lecture	CC	Knows-how	L&GD,DIS
CO 5,CO 8	Discuss the requirements of Schedules H, G, X (prescription and safety), and Schedule Y (pharmacological information)	1	Lecture	CAP	Knows-how	DIS,BL
CO 5,CO 8	Demonstrate the formulation of a proprietary formula and apply for a license	5	Practical Training 31.4	PSY-GUD	Shows-how	CBL,D,DIS
CO 5,CO 8	Apply for GMP certification	4	Experiential-Learning 31.4	PSY-MEC	Does	PrBL,DIS,CBL
CO 5,CO 8	Prepare a new formula and apply for a mock license	5	Experiential-Learning 31.5	PSY-MEC	Does	CBL,DIS,PrBL

M 31 Unit 5 Pharmaceutical observation of drugs and cosmetics ASU drugs 5.1. Shelf life and stability of ASU drugs: recent amendments

5.2. Use of Preservatives in ASU drugs

5.3. Packaging and labelling requirements for ASU drugs

References: 28,29

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Describe Shelf life of ASU drugs: recent amendments, Preservatives, and Discuss Packaging and labelling technique	1	Lecture	CC	Knows-how	L&PPT,DIS,PAL
CO 5,CO 8	Evaluate label compliance and identify shortcomings in given labels	5	Experiential-Learning 31.6	PSY-MEC	Does	DIS,PrBL
CO 5,CO 8	Design and develop a label for a hypothetical ASU product, ensuring compliance with regulatory requirements	4	Experiential-Learning 31.7	PSY-MEC	Does	PrBL,DIS,PER

M 31 Unit 6 Miscellaneous Regulatory Acts related to drugs and cosmetics6.1. Narcotic and Psychotropic Substances Act 1985

- 6.2. Factories Act, 1948
- 6.3. Industries Act, 1951
- 6.4. Biological Diversity Act 2002
- 6.5. Consumer Protection Act 1986
- 6.6. Drugs and Magic Remedies Act, 1954
- 6.7. Medicinal and Toilet Preparations Act, 1955
- 6.8. Opium Act, 1857
- 6.9. Pharmacy Act 1948
- 6.10. Recent Amendments in D & C Act concerning Ayurvedic Drug Industry

References: 30,31,32,33,34,35,36,37

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Describe the key provisions of the Narcotic and Psychotropic Substances Act, 1985, Factories Act, 1948, and Industries Act, 1951	1	Lecture	CC	Knows-how	L&PPT,DIS,BS
CO 5,CO 8	Discuss the Biological Diversity Act 2002, Consumer Protection Act 1986, and Drugs and Magic Remedies Act, 1954	1	Lecture	CC	Knows-how	L&PPT,IBL,DIS

CO 5,CO 8	Discuss Medicinal and Toilet Preparations Act, 1955, Opium Act, 1857, and Pharmacy Act 1948	1	Lecture	CC	Know	L&PPT,LS
CO 5,CO 8	Describe Recent Amendments in D & C Act concerning Ayurvedic Drug Industry	1	Lecture	CC	Knows-how	C_L,DIS,ML,PER,L&PPT
CO 5,CO 8	Demonstrate Landmark Judgments under the NDPS Act	4	Practical Training 31.5	PSY-GUD	Shows-how	CBL,PER,DIS,D
CO 5,CO 8	Demonstrate Case Law on the Factory Act	4	Practical Training 31.6	PSY-GUD	Shows-how	DIS,D,CBL
CO 5,CO 8	Demonstrate Case Study under the Drugs and Magic Remedies Act	4	Practical Training 31.7	PSY-GUD	Shows-how	CBL,DIS,D
CO 5,CO 8	Analyse Landmark Judgments under the NDPS Act	5	Experiential-Learning 31.8	PSY-MEC	Shows-how	CBL,PrBL
CO 5,CO 8	Prepare Case Studies and Report related to Objectionable Advertisements	4	Experiential-Learning 31.9	PSY-MEC	Does	BS,DIS,CBL,PrBL

Practical Training Activity

Practical Training 31.1 : Recording their observations regarding hypothetical issue through Mock composition exercise of demonstration of the roles of DTAB (Drug Technical Advisory Board) composition, including representatives from DGHS, DCGI, pharmacologists

The teacher will demonstrate the roles of DTAB (Drug Technical Advisory Board) composition, including representatives from DGHS, DCGI, pharmacologists, and others, and conduct a mock meeting to discuss a hypothetical issue, such as the approval of a new drug or banning a drug. The students will participate in the mock meeting, following the teacher's guidelines, and record their observations.

Practical Training 31.2 : Mock Import License Application

The teacher will demonstrate filling a sample Form 10D for importing an ASU product, such as a herbal capsule, and show mock supporting documents to be attached, including the Free Sale Certificate and lab test report. The students will record their observations and engage in a class discussion.

Practical Training 31.3 : Demonstration of case scenarios of Misbranded/spurious drugs and cosmetics

The teacher will demonstrate case scenarios related to misbranded or spurious drugs/cosmetics, explaining how to identify misbranded products based on misleading labelling and spurious products through fictitious company names and other deceptive tactics. The students will record their findings and observations.

Practical Training 31.4 : Application for a license of a proprietary formula

The teacher will demonstrate how to formulate a treatment protocol for a selected disease, utilizing Schedule I and published literature. The teacher will also explain the process of applying for a license and showcase the necessary documents and study reports required for the application.

Practical Training 31.5 : Demonstration of Landmark Judgments under the NDPS Act

The teacher will select 1-2 landmark judgments under the NDPS Act and demonstrate how courts have interpreted key provisions, such as Section 27 (consumption) and Section 21 (possession). The discussion will focus on crucial aspects, including quantity differentiation (small vs. commercial), presumption of guilt, and bail provisions under Section 37.

Practical Training 31.6 : Case Law demonstration on the Factory Act

The teacher will present a notable case study related to labor law violations, focusing on issues such as worker safety, overtime pay disputes, or factory licensing. Students will document the case in a standard format and engage in a class discussion.

Practical Training 31.7 : Case Study Demonstration under the Drugs and Magic Remedies Act

The teacher will demonstrate a case study illustrating the application of the Drugs and Magic Remedies Act.

Experiential learning Activity

Experiential-Learning 31.1 : Case Law analysis on the Factory Act

The teacher will instruct each student to explore a case study related to Worker safety violations/Overtime pay disputes/Factory licensing issues. The students will present the case in a standard format.

Experiential-Learning 31.2 : Technical Report to DTAB: Reporting Adverse Drug Reactions (ADRs)

The teacher will assign students to prepare a mock technical report on the adverse effects of a new cosmetic product, adhering to the technical and regulatory guidelines outlined in the Drugs and Cosmetics (D&C) Act. Students will present their reports, which will be reviewed and verified by the teacher for accuracy and compliance.

Experiential-Learning 31.3 : Identification of Misbranded/Spurious Drugs and Cosmetics

Students will be tasked with collecting and compiling real-life case studies on misbranded or spurious drugs and cosmetics from published literature or electronic resources. They will analyze each case to identify and document the key parameters that classify a product as misbranded or spurious. Finally, students will present their findings and engage in a class discussion to share insights and perspectives.

Experiential-Learning 31.4 : Application for GMP certification

The students will be instructed to compile all the mock forms required to get GMP certification and try to fill out the forms. The teacher will discuss - How to get the licence for single herb/herbo-mineral compound/extract, and how to apply for a Loan licence. Students will record the findings, discuss with the teacher

Experiential-Learning 31.5 : Development and Licensing of Proprietary Herbal/ Ayurvedic Formulations

The teacher will assign each student a different disease and instruct them to formulate a herbal/ Ayurvedic formula for the given condition. Students will then develop the necessary documents to support a license application for their formulated product. The teacher will review and discuss the submissions, providing conclusions and feedback

Experiential-Learning 31.6 : Label Compliance Check

The teacher will distribute various Ayurvedic, Siddha, and Unani (ASU) drug labels (authentic or printed) among the students. Each student will assess their assigned label for compliance with the requirements outlined in Rule 161, documenting their findings. The students will then discuss their observations with the teacher

Experiential-Learning 31.7 : Product Label Designing as per D&C Act

The teacher will assign each student a different dosage form and instruct them to design a product label in compliance with the Drugs and Cosmetics (D&C) Act. Students will create their labels, present them to the class, and engage in a discussion with the teacher to receive feedback and guidance.

Experiential-Learning 31.8 : Analysis of Landmark Judgments under the NDPS Act

The teacher will instruct each student to explore a landmark judgment under the NDPS Act, evaluating court interpretations of key provisions (Sections 27, 21, etc.) and focusing on quantity differentiation, presumption of guilt, and bail provisions under Section 37.

Experiential-Learning 31.9 : Objectionable Advertisements: Case Studies and Report

The students will be instructed to explore the cases coming under the Drug and Magic Remedies (Objectionable Advertisements) Act, 1954. Each student will explore a case, present the observations, and report the same in standard format to the respective pharmacovigilance cell.

Modular Assessment

Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 75 marks for this module. Keep a structured marking pattern. Utilize various assessment methods in each module throughout the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. Select activity for 25 marks each (3 x 25 = 75 Marks): • SAQ • LAQ • Class presentation or Any practical in converted form can be taken for assessment. (45 Marks) and Any experiential learning method in converted form can be taken for assessment (30 marks)	6

Module 32 : Entrepreneurship and Start-Ups

Module Learning Objectives

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

1. Define Entrepreneurship
2. Identify Entrepreneurial Traits
3. Describe the Entrepreneurial Process

4. Enlist Different Types of Entrepreneurships
5. Recognize the opportunities of entrepreneurship and start-ups

M 32 Unit 1 Entrepreneurship and Startup
 1.1. Introduction to Entrepreneurship and Start-ups
 1.2. MSMED Act and its Process of Registration and Role of Department for Promotion of Industry and Internal Trade(DPIIT) and Bharat Startup Knowledge Access Registry (BHASKAR)
 1.3. Types of Enterprises and Role of Enterprises in National and Global Economy
 1.4. Government Policies, Schemes, and Institutional Support for Entrepreneurship

References: 38,39,40

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 7,CO 8	Describe entrepreneurship, the startup life cycle, the MSME Act, and the process of registration	1	Lecture	CAP	Know	L&PPT ,L&GD
CO 5,CO 7,CO 8	Identify the role of DPIIT (Department for Promotion of Industry and Internal Trade); BHASKAR (Bharat Startup Knowledge Access Registry) in the promotion of entrepreneurship and startups	1	Lecture	CC	Know	L_VC,L& PPT
CO 5,CO 8	Create an elevator pitch for a startup idea	2	Experiential-Learning 32.1	PSY-MEC	Does	DIS,PBL, PrBL

M 32 Unit 2 Process of entrepreneurship development
 2.1. Need and the process of entrepreneurship development.
 2.2. Dynamics of Entrepreneurial Motivation.
 2.3. Developing Entrepreneurial Competencies

References: 38,39,40

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Discuss the dynamism of Entrepreneurial Motivation and key entrepreneurial competencies	1	Lecture	CC	Knows-how	SDL,DIS, L&GD,B S,PAL
CO 5,CO 8	Demonstrate the process of development of a basic business model as per the template	3	Practical Training 32.1	PSY-GUD	Knows-how	D,BS,DIS
CO 5,CO 8	Conduct and document market research for a start-up, including survey design and analysis	4	Experiential-Learning 32.2	PSY-ORG	Does	PrBL

M 32 Unit 3 Project Proposal for new Invention/startup3.1. Challenges and the feasibility report of the Startups
3.2. Planning, resource mobilisation, and implementation of a start-up project

References: 38,39,40

3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Identify the challenges and feasibility report of the start-up	1	Lecture	CC	Knows-how	L&PPT ,DIS
CO 5,CO 8	Carry out A Case Study-Based Role-Play, navigating a Startup's Early Days:	2	Experiential-Learning 32.3	PSY-ADT	Does	DIS,RP,C BL

M 32 Unit 4 Intellectual Property Rights and Patents4.1. Introduction to IPR and Patents
4.2. Indian and international patent laws, proposed amendments as applicable to herbal/natural products and processes.
4.3. Procedure for patent filing.
4.4. Geographical Indication and Copyright

References: 38,39,40

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3A	3B	3C	3D	3E	3F	3G
CO 5,CO 8	Define IPR, describe the purpose and importance of IPR, and the laws governing patent	1	Lecture	CC	Knows-how	DIS,L&P PT
CO 5,CO 8	Demonstrate the process of patent filing	3	Practical Training 32.2	PSY-GUD	Shows-how	D,BS,DIS
CO 5,CO 8	Demonstrate a case scenario of the new molecule patent	2	Practical Training 32.3	PSY-GUD	Shows-how	D,CBL,D IS
CO 5,CO 7,CO 8	Demonstrate a case scenario of patenting the formulation process	2	Practical Training 32.4	PSY-GUD	Shows-how	CBL,D,DIS,L&P PT
CO 5,CO 8	Design an application to Patent the formulation process	3	Experiential-Learning 32.4	PSY-MEC	Does	DIS,CBL
CO 5,CO 8	Identify the patentability of a product	2	Experiential-Learning 32.5	CS	Does	CBL,DIS

Practical Training Activity

Practical Training 32.1 : Demonstration of the process of development of a basic business model as per the template

Students will design a new startup concept, develop a comprehensive business plan, create a prototype, and pitch their idea. They will discuss, brainstorm innovative ideas, and select one idea to develop further. Each student will prepare a written business plan, including market research, financial projections, and marketing strategies. They will also create a prototype or minimum viable product to demonstrate their idea. Students will then prepare a persuasive elevator pitch to present their startup idea to investors, and finally, they will present their pitches and prototypes to the class, receiving feedback and guidance

Practical Training 32.2 : Demonstration of patent filing

The teacher will demonstrate filing a provisional patent in a real-life or simulated setting.

Practical Training 32.3 : Demonstration of a scenario: The New Molecule Patent

The teacher will demonstrate a scenario where an R&D team in a mid-sized pharmaceutical company has discovered a promising new molecule or new chemical entity (NCE) for treating a rare disease condition. The demonstration will cover the process of patent filing, including timing, scope, strategy, disclosure of information, risks, and challenges.

Practical Training 32.4 : Demonstration of a case scenario of patenting the formulation process

The teacher will demonstrate a scenario where an Ayurveda pharmaceutical company has developed a modified dosage form featuring a novel delivery mechanism, utilizing traditional ingredients. The demonstration will focus on patenting the formulation process, excluding the herbs themselves. Additionally, the teacher will explore utility model options (where applicable), and create an IP protection roadmap, encompassing design patents, trademarks, and copyrights for packaging and branding.

Experiential learning Activity**Experiential-Learning 32.1** : Creating an elevator pitch for a startup idea

Students will design a new startup concept, develop a comprehensive business plan, create a prototype, and pitch their idea. They will discuss, brainstorm innovative ideas, and select one idea to develop further. Each student will prepare a written business plan, including market research, financial projections, and marketing strategies. They will also create a prototype or minimum viable product to demonstrate their idea. Students will then prepare a persuasive elevator pitch to present their startup idea to investors, and finally, they will present their pitches and prototypes to the class, receiving feedback and guidance.

Experiential-Learning 32.2 : Conducting market research for a start-up, including survey design and analysis

Each student will conduct a market survey for a startup, then design a startup proposal based on the survey findings, including logical analysis and recommendations. Students will record and present their proposals, demonstrating their understanding of market research and its application in startup development

Experiential-Learning 32.3 : Navigating a Startup's Early Days: A Case Study-Based Role-Play

The teacher will assign each student a case study of a startup in its early days. Provide each student with a set of role-play scenarios related to the startup's early days, including pitching to investors, managing conflicts between co-founders, handling customer complaints, and deciding on a marketing strategy. After the role-play, each student will be asked to reflect on their experiences and discuss questions such as what challenges they faced, how they overcame these challenges, and what they learned from the experience. Finally, ask each student to present their findings and insights to the class

Experiential-Learning 32.4 : Designing of an application to Patent the formulation process

The teacher will allot each student a different scenario related to pharmaceutical modification. The student will design and develop a patent application for the formulation process	
Experiential-Learning 32.5 : Identification of the patentability of a product	
The teacher will allot each student a drug/product containing the ingredient mentioned in Ayurvedic classics. Students will be asked to check the patentability of the product, present their findings, and discuss	
Modular Assessment	
Assessment method	Hour
Conduct a structured Modular assessment. The assessment will be for 25 marks for this module. 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 points Select one activity for 25 marks: Business Plan Development (Project-Based Assessment) Description: Students or teams develop a full business plan for a new startup idea. Includes: Executive summary, Market analysis, Product/Service description, Revenue model, financial projections, Marketing strategy, Funding needs Evaluates: Research, critical thinking, creativity, and practical application OR Peer Review Assessment Activity: Students evaluate other teams' pitches or business plans OR Any practical in converted form can be taken for assessment. (25 Marks) OR Any experiential learning method in converted form can be taken for assessment (25 marks)	2

Table 4 : Practical Training Activity

(*Refer table 3 of similar activity number)

Practical No*	Practical name	Hours
1.1	Demonstration of the application of the Mendeleev Periodic table in mapping Rasadravyas	5
1.2	Demonstration of different Rasadravyas mentioned in different classics and analysis of the classification of Rasa Dravyas	5
1.3	Geological Mineralogical Identification of Rasadravyas	5
1.4	Demonstration of Krutrima and Pratinidhi Rasadravyas	5
2.1	Demonstration and comparison of the temperature pattern and total duration of different traditional Puta with EMF	5
2.2	Demonstration of the art of Gandhaka Jarana: A Practical Exploration of the Rasa Jarana Process, Understanding its Role and Significance in Rasashastra	5
2.3	Demonstration of Amritikarana and Lohitikarana: Traditional Methods for Mica Processing in Rasashastra	5
2.4	Demonstration and Observation of Satva Patana	5
3.1	Demonstration of Samanya and Vishesh Shodhana procedures of Parada	7
3.2	Parada Jarana, Parada Murchana and Bandhana processes	5
3.3	Demonstration of the Parada Samskara procedures- Swedana, Mardana, Murchana, and Utthapana	8
4.1	Analysis and Verification of Maharasa Dravya Samples.	2
4.2	Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Abhraka and Vaikranta	5
4.3	Practical Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Makshika and Vimala	5
4.4	Practical Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Shilajatu and Sasyaka/Tuttha	3
4.5	Practical Application of Shodhana, Marana, and Other Pharmaceutical Procedures for Chapala/Kharpara	2
4.6	Physico-Chemical Characterization of Bhasma/Shodhita Products in Maharasa Dravya category.	3
5.1	Authentication of Uparasa Dravyas	2

5.2	Demonstration of Shodhana, Marana and other pharmaceutical procedures for Uparasa	4
5.3	Demonstration of Quality Control testing for the products of Uparasa Dravya	4
5.4	Identification and authentication of Sadharana Rasa Dravyas	2
5.5	Demonstration of Shodhana, Marana and other pharmaceutical procedures for Sadharana Rasa	4
5.6	Demonstration of Quality Control testing for the products of Sadharana Rasa Dravya	4
6.1	Demonstration of authentication of Dhatu Dravya	2
6.2	Pharmaceutical processing (Shodhana & Marana) of metals	4
6.3	Quality control of metallic preparations	4
6.4	Identification of Upadhatu samples	2
6.5	Shodhana and Marana of Upadhatu	4
6.6	Demonstrate the Quality control of sub-metallic formulations	4
7.1	Demonstration of Shodhana, marana, and Pishti Nirmana of Sudha varga Dravya	6
7.2	Demonstration of the quality testing procedures for Bhasma/Pishti of Sudha vargeeya Dravya	4
7.3	Demonstration of Shodhana, marana and Pishti Nirmana of Sikata varga Dravya	6
7.4	Demonstration of the quality testing procedures for Bhasma/Pishti of Sikata vargeeya Dravya	4
7.5	Demonstration of Shodhana Process of Visha Dravya	6
7.6	Demonstration of the analytical testing process for Shodhita Visha dravya	4
8.1	Mineralogical identification of precious and semiprecious stones under Ratna and Uparatna varga	3
8.2	Demonstration of SOP of Pishti Kalpana of Ratna-Uparatna	3
8.3	Demonstration of different methods of Gandhaka Druti and Gandhaka taila	2

8.4	Demonstration of the Pharmaceutical modification of Gandhaka Druti and Gandhaka Taila	2
9.1	Demonstration of unique Panchavidha Kashaya Kalpana	2
9.2	Demonstration of the application of QAQC parameters used for quality control of herbal drugs	4
9.3	Demonstration of formulations to understand uniqueness of proportion of the ingredients.	5
9.4	Assessment of Phytochemicals in the prepared dosage form by TLC	4
9.5	Demonstration of Kwatha Kalpana considering its process optimization	5
10.1	Demonstration of Samskara and alterations in the qualities observed during the preparation of Ayurvedic dosage forms.	4
10.2	Demonstration of formulations prepared with specific Aushadhi Gana and various classes(Vargas) from classics.	4
10.3	Demonstration of Dosage Form Design.	6
10.4	Demonstration and analysis of the importance of preservatives, additives, excipients, fillers, etc.	6
11.1	Application of Knowledge of mana Paribhasha in the preparation of various formulations	4
11.2	Unit Conversion for Pautava and Druvaya Mana	2
11.3	Preparation of Formulations using the Volumetric Method of Measurement	2
11.4	Preparing formulations with a diverse range of raw materials.	6
11.5	Demonstration of the machinery used for large-scale production in Ayurvedic pharmacies, with their mechanism	6
12.1	Develop Process validation Protocol and demonstrate the preparation of formulations following SOP	10
12.2	Develop Process validation Protocol and demonstrate the preparation of formulations following SOP	10
13.1	Formulations from Classics prepared with aahara Dravya	4
13.2	Demonstration of therapeutic diet formulations	4
13.3	Demonstrate Protocol for the selected Aahara Kalpana-	4

13.4	Demonstration of the preparation of novel Ayurvedic food products	4
13.5	Demonstration of food processing techniques used in current Ayurvedic food Industries	4
14.1	Demonstration of Rasayana Formulations.	8
14.2	Demonstration of Body care products.	6
14.3	Demonstration of the preparation of Modified Cosmeceuticals	6
15.1	Demonstration of formulations used in various branches of Ayurveda.	5
15.2	Survey the different dosage forms used by local health practitioners.	5
15.3	Demonstration of frequently used formulation for Shodhana and Shamana Chikitsa of common diseases.	10
16.1	Market Status of Ayurvedic Pharmacy Industry	8
16.2	Internship / Visits to GMP-certified Ayurvedic pharmacy Units(Minimum 5 units- Small/ Medium/ Large)	6
16.3	Perform any 5 QC practicals on formulation prepared by yourself.	6
17.1	Demonstration of the rational prescription for a selected disease	3
17.2	Demonstration of the need and role of Kshetrikarana	3
17.3	Demonstration of common pathya and apathya Ahara during rasa yoga sevana	2
17.4	Demonstration of the common pathya-apathya Vihara during rasa yoga sevana	2
17.5	Determination of signs and symptoms of rasa vikaras and their management	6
17.6	Comparative assessment of Ashuddha and Shuddha Bhasma effects	2
17.7	Identification of heavy metal toxicity	2
18.1	Demonstration of chrono therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics.	3
18.2	Demonstration of Modulation of dosage form action by chronotherapeutic administration in Ayurveda	3

18.3	Demonstration of appropriate Anupana for the selected dosage form in different clinical conditions.	3
18.4	Demonstration of the calculation of paediatric dose using different formulae.	3
18.5	Demonstration of the Patient-centric evaluation of Matra.	3
18.6	Re-analysing classical ayurvedic drugs for novel indications	5
19.1	DOAP of preparation and SOP of Kharaleeya Rasayana.	7
19.2	Demonstration of the method of preparation based on SOP of parpati kalpana.	7
19.3	Demonstration of the method of preparation and SOP of pottali kalpana.	8
19.4	Demonstration of the method of preparation and SOP of Kupipakwa Rasayana.	8
20.1	Demonstration of the SOP and preparation of Ayaskriti.	3
20.2	Demonstration of the SOP and preparation of Louha Kalpa.	3
20.3	Demonstration of the SOP and preparation of Mandura Kalpa..	2
20.4	Clinical application of mandura kalpa.	2
21.1	Demonstration of the clinical application of Rasoushadhi in selected Srotas, illustrating their practical utility and therapeutic outcomes in addressing specific health conditions.	3
21.2	Demonstration of the clinical applicability of Rasoushadhi in Medical Emergencies	3
21.3	Demonstration of role of Rasoushadhi in clinically challenging conditions	2
21.4	Demonstration of the role of Rasoushadhi as Rasayana in clinically challenging conditions.	2
22.1	Demonstration of the preparation of Vati, Guggulu Kalpa, and their modified modern dosage forms	5
22.2	Designing an S.O.P for the preparation of Ayurvedic suppository specifying its clinical utility based on Varti Kalpana	4
22.3	Demonstration of the role of pharmaceutical additives and Samyak Paka of Avaleha	5
22.4	Demonstration of S.O.P for a selected Sneha Kalpa which is widely used and determine its analytical profile	6

22.5	Demonstration of S.O.P for the preparation of a selected Arka and Dravaka and create their analytical profile.	5
22.6	Demonstration of S.O.P for preparing a selected sandhana Yoga and determine the analytical standards	5
23.1	Demonstration of the SOP and quality analysis of a selected Churna yoga	5
23.2	Demonstration of the preparation of a selected Paneeya Kshara and Pratisaraneeya Kshara and their quality analysis	5
23.3	Demonstration of the preparation of a selected Lavana formulation following different methods and analytical profiling	5
23.4	Demonstration of the preparation of a selected Satva and performing its analytical profiling	5
23.5	Demonstration of the preparation of Masi and its analytical profiling	5
23.6	Demonstration of the pharmaceutical modification of Masi Kalpana	5
24.1	Demonstration of various Netra Kalpa and their clinical applications	3
24.2	Preparation of a novel dosage form using one of the classical lepa Yoga	4
24.3	Preparation of a selected Upanaha which is useful in treating Shopha	3
25.1	Demonstration of training in the basics of machine learning and its application	4
25.2	Prediction of drug likeliness using machine learning	4
25.3	Demonstration of different 3D printers used in the drug delivery system	4
25.4	Comparison of traditional dosage forms versus 3D printed ones regarding the structure and dissolution	4
25.5	Demonstration of the prediction of Drug-Target Interaction	4
26.1	Demonstration of pharmacological experiments using videos or simulation software	10
26.2	Demonstrate the effect of drugs on animals by simulated experiments	10
27.1	Demonstration of network pharmacology applications with the help of a video	10
27.2	Demonstration of reverse pharmacology applications with the help of a video	10

28.1	Demonstration of the process of mock GMP Inspection	5
28.2	Demonstration of GMP Hierarchy and Responsibilities	5
28.3	Demonstration of Identification and Classification of Packaging Materials	5
28.4	Demonstration for SOP Writing of different equipment	5
29.1	Drug Information and Case Analysis	5
29.2	Prescription Handling and Dispensing	5
29.3	Data Interpretation and Pharmacokinetic Calculations	5
29.4	Formulary Review and Management	5
30.1	Demonstration of dry heat sterilization method	3
30.2	Demonstration of Aseptic Technique Practice for the transfer of microbes	2
30.3	Demonstration of Personnel Contamination Assessment	7
30.4	Demonstration of Different Types of Spoilage	8
31.1	Recording their observations regarding hypothetical issue through Mock composition exercise of demonstration of the roles of DTAB (Drug Technical Advisory Board) composition, including representatives from DGHS, DCGI, pharmacologists	4
31.2	Mock Import License Application	4
31.3	Demonstration of case scenarios of Misbranded/spurious drugs and cosmetics	5
31.4	Application for a license of a proprietary formula	5
31.5	Demonstration of Landmark Judgments under the NDPS Act	4
31.6	Case Law demonstration on the Factory Act	4
31.7	Case Study Demonstration under the Drugs and Magic Remedies Act	4
32.1	Demonstration of the process of development of a basic business model as per the template	3

32.2	Demonstration of patent filing	3
32.3	Demonstration of a scenario: The New Molecule Patent	2
32.4	Demonstration of a case scenario of patenting the formulation process	2

Table 5 : Experiential learning Activity

(*Refer table 3 of similar activity number)		
Experiential learning No*	Experiential name	Hours
1.1	Preparing a chronological tree of Rasashastra and its integration with other medical traditions	5
1.2	Integration of the selected metals and minerals with the periodic table elements	5
1.3	Recognise Rasadravya based on their Graahyatva-Agrahyatva	5
1.4	Identification of Rasadravya using geological/mineralogical characters	5
1.5	Exploring Sandigdha and Anuplabhdha Rasadravyas and propose suitable alternatives	6
2.1	Hands-on Comparison of Traditional and Modern Puta Methods: Observing and Analyzing Temperature Patterns and Duration	5
2.2	Exploring Thermal Dynamics in Traditional Puta Systems: An Experiential Investigation of Fuel Variations, Temperature Patterns, and Thermodynamic Principles	5
2.3	Perform an experiential Investigation of Amritikarana and Lohitikarana Procedures, Exploring Safety, Efficacy, and Principles of Transformation.	4
2.4	Performing and analyzing the Satva Patana procedure.	2
2.5	Application of Time-Tested Principles of Classical Drug Manufacturing: by integrating Toya Sannikarsha, Agni Sannikarsha, Toyagni Sannikarsha, Shaucha, and Manthana to Optimize Pharmaceutical Quality, Safety, and Efficacy.	2
2.6	Exploring the Interplay of Desha and Kala on Pharmaceutical Quality: A Hands-on Investigation of Geographical and Temporal Influences on Drug Manufacturing, Analyzing Processes and Findings to Enhance Quality, Safety, and Efficacy	2
2.7	Develop Mastery of Classical Drug Manufacturing: Integrating Time-Tested Principles of Vasana and Bhavana to Optimize Pharmaceutical Quality, Safety, and Efficacy	4
2.8	Demonstration of the effect of Kalaprakarsha and Bhajana in Pharmaceutical Processing, Analyzing Processes and Findings to Optimize Quality, and stability	2

3.1	Samanya Shodhana of Parada	3
3.2	Vishesha Shodhana procedures of Parada	3
3.3	Performance of the Parada Ashta Samskara procedures- Patana, Bodhana, Niyamana, and Deepana	10
3.4	Comparison and analysis between the Pharmacodynamics and pharmacokinetics of mercury and mercurial products	5
3.5	Analysis of mercury toxicity and ADR incidences	5
4.1	Pharmacotherapeutic attributes of Abhraka Bhasma and Vaikranta Bhasma	5
4.2	Critical Analysis of Abhraka and Vaikranta: Pharmacology and Clinical Applications	2
4.3	Explore and perform the Makshika Bhasma and Vimala Bhasma	5
4.4	Exploration and performance of Shodhana and other pharmaceutical procedures of Shilajit and Sasyaka/Tuttha	6
4.5	Explore and perform the pharmaceutical procedure, like Shodhana, Marana for Chapala/Kharpara, using authentic or substitute drugs.	3
4.6	Exploring New Metallic/Mineral Resources that align with Maharasa Dravyas Principles.	5
5.1	Identify and perform an authentication process of Uparasa Dravyas	3
5.2	Performing Quality Control tests for the products of Uparasa Dravya	3
5.3	Preparation and presentation of formulations of Uparasa Dravya	5
5.4	Critical Review of toxicity and ADRs of Haratala and Manahshila	2
5.5	Identify and authenticate Sadharana Rasa Dravyas	3
5.6	Performing Quality Control tests for the products of Sadharana Rasa Dravya	3
5.7	Preparation and presentation of formulations of Sadharana Rasa Dravya	3
5.8	Field Survey: Manufacturer/clinicians using Sadharana Dravyas	4

6.1	Identification & documentation of classical Dhatus	3
6.2	Quality assessment of Dhatu Bhasma	3
6.3	Formulation preparation using Dhatu Bhasma	5
6.4	Critical appraisal of ADRs due to metals	2
6.5	Identification of Upadhatu samples	3
6.6	Performing Quality Control tests for the products of Upadhatu	3
6.7	Preparation of Upadhatu formulations	3
6.8	Field survey: Manufacturers or Vaidyas using Dhatu/Upadhatu	4
7.1	Shodhana, marana, and Pishti Nirmana of Sudha varga Dravya	7
7.2	Quality testing procedures for Bhasma/Pishti of Sudha Vargeeya Dravya	6
7.3	Shodhana, marana and Pishti Nirmana of Sikata varga Dravya	7
7.4	Quality testing procedures for Bhasma/Pishti of Sikata vargeeya Dravya	6
7.5	Performing Shodhana of Visha Dravyas as per different classics	7
7.6	Performing analytical testing process for Shodhita Visha dravya	6
8.1	Identification of the precious and semiprecious stones under Ratna and Uparatna varga using keys for mineralogical identification	3
8.2	Identification of substitutes for Ratnavarga and Uparatna varga drugs	3
8.3	Preparation of the Pishti of Selected Ratna or Uparatna	3
8.4	Preparation of Gandhaka Druti using different media	4
9.1	Preparation of unique formulation from the category of Panchavidha Kashaya Kalpana	3
9.2	Standardization of raw material used in Bhaishajya Kalpana.	6

9.3	Interpretation of the significance of understanding the proportion of ingredients of formulations quoted in the classics	6
9.4	Performing the extraction of phytochemicals in Ayurvedic formulations.	5
9.5	Review of Research Updates in the field of Ayurvedic pharmaceuticals along with modern scientific validation methods.	6
10.1	Illustration of various Prakshepa Dravyas and their proportions stated in the classics.	6
10.2	Classical techniques of Shaktyutkarsha/ Potency enhancement	10
10.3	Evaluation of Methods used to improve potency and efficacy in modern pharmaceuticals	10
11.1	Mana Paribhasaha from classics and its importance for preparing classical formulations.	6
11.2	Preparation of Classical Formulations by applying knowledge of converted units	3
11.3	Application of classical knowledge of Mana paribhsha with understanding its effect on preparing formulations.	3
11.4	Significance of proportion of ingredients	7
11.5	Assessment of advanced tools and techniques used currently for manufacturing Ayurvedic formulations.	7
12.1	Studying the documentation related to Standard Operating Procedures (SOPs) used in pharmacies.	6
12.2	Construct a protocol for unique classical formulations and prepare the selected product following SOP	10
12.3	Preparation of Prepare different novel modern dosage forms	5
12.4	Overview of Novel Dosage Forms.	5
13.1	Critical appraisal of unique formulations prepared from Aahara dravya	6
13.2	Disease specific Ayurvedic Ahara	6
13.3	Personalised prescription for Aushadhi Siddha Ahara.	6
13.4	Exploratory Survey about the Ayurvedic Food Industry and Ayurvedic Food products available in the market.	4

13.5	Analysis of Functional Food and Modified Food Formulations in Ayurvedic Food Industry.	4
14.1	Role of Ayurvedic Rasayana Vajikarana Formulations	5
14.2	Role of Ayurvedic Formulations in the wellness of specific body parts	7
14.3	Market survey for Ayurvedic Body care products.	7
14.4	Designing and preparing novel Ayurvedic Cosmeceuticals.	7
15.1	Understanding the routes of drug administration is crucial, as it highlights the importance of well-designed dosage forms that improve patient outcomes and therapeutic effectiveness.	10
15.2	Hands-on training focusing on innovative formulations	10
15.3	Learning about the R&D department of Ayurvedic Pharmacy.	6
16.1	Assessment of the real-life experience of the market for the growing popularity of Ayurvedic products.	10
16.2	Internship in the Ayurvedic Pharmacy.	8
16.3	QAQC Laboratory Training	8
17.1	Exploring the Rasa Chikitsa through field visits.	6
17.2	Exploring the procedure and benefits of kshetrikarana	6
17.3	Outcome of compliance and non-compliance with the pathya apathya guidelines	6
17.4	Evaluation of prescription errors containing Rasoushadhis	4
17.5	Analysis of chelation therapy in heavy metal toxicity	4
18.1	Exploring chrono therapeutic alignment of Oushadha Sevana Kala with patient–disease dynamics.	3
18.2	Exploring the modulation of the action of the dosage form by chronotherapeutic administration in Ayurveda.	3
18.3	Enlisting appropriate Anupanas for various formulations in different clinical conditions.	3

18.4	Optimising drug response through synergistic Anupana integration.	4
18.5	Exploring the role of Anupana in the modulation of drug tolerance and safety.	4
18.6	Exploring posology principles from an ayurvedic and modern pharmacology perspective.	4
18.7	Exploring novel indications for classical Ayurvedic formulations	3
18.8	Exploring the Reverse pharmacological approach for drug repurposing in Ayurveda	2
19.1	Validation of utility of kharaleeya rasayana to clinical case practice.	4
19.2	Demonstration of the impact of Bhavana – A bioactivation tool in Kharaleeya Rasayana.	3
19.3	The pharmacodynamic rationale and clinical application of parpati kalpana.	4
19.4	Preparation of Pottali following SOP	8
19.5	Analysis of the pharmacological profile of the ingredients, bhavana dravya, and the pharmaceutical procedure adopted in achieving therapeutic precision.	5
19.6	Preparation of selected Kupipakwa Rasayana	10
19.7	Demonstration of the scientific rationality for the selection of specific Kupipakwa Rasayana in the given scenario..	5
20.1	Decoding the role of Ayaskriti. as a multi-target formulation.	4
20.2	Application of Louha Kalpa by integrating through textual insights with real word cases for the therapeutic purpose.	4
20.3	Gomutra as a medium of pharmaceutical processing and as a bio enhancer – “Re-evaluating its role in mandura kalpa.”	5
21.1	Therapeutic application of Rasoushadhi in different Srotas	3
21.2	Exploring the clinical utility of Rasoushadhi in Medical Emergencies	4
21.3	Exploring the role of Rasoushadhi in clinically challenging conditions such as Cancer.	3
21.4	The role of Rasoushadhi in clinically challenging conditions such as neurodevelopmental and neurodegenerative diseases.	3

22.1	Analysis of the role of Gugulu Kalpana in various clinical conditions by selecting a specific Gulggulu Yoga.	8
22.2	Analysis of the role of selected leha yoga in different clinical conditions.	8
22.3	Analysis of different stages of Sneha Paka	8
22.4	Illustration of the clinical application of selected Arka/Dravaka Kalpa	6
22.5	Comparative analysis of Asava Arishta Samples having different percentage and types of sugar	5
22.6	Record the dose, duration, indications, and clinical outcome of the various formulation i.e.Sandhana Kalpanas in the prescribed patients.	4
23.1	Evaluating the role of a selected Churna in a specific clinical condition	8
23.2	Clinical applications of Kshara and Ksharasutra	8
23.3	Demonstration of role of Lavana Kalpana in various clinical conditions	8
23.4	Role of a selected satva in a specified disease condition	7
23.5	Role of Malaharas as a Topical application in Skin disease,	8
24.1	Exploring the the role of Ayurvedic ophthalmic preparations in various eye diseases	5
24.2	Demonstration of the role of lepa Yogas in managing various medical needs by innovative approaches	5
24.3	The role of Malahara as a Topical application in Skin disease.	3
25.1	Performing De Novo Drug Design Using Generative Models	5
25.2	Analysis of ADMET properties using AI tools	6
25.3	Identification of potential adverse effects of drug candidates using a dataset and tools	5
25.4	Extraction of potential drug-disease relationship by using through Literature /data Mining	5
25.5	Interpretion of Pharmacokinetics and Toxicology Modelling using appropriate AI tools and methods	5

26.1	Analysis of the mechanism of action of drugs acting on the Cardiovascular system through a case study scenario	7
26.2	Analysis of the mechanism of action of drugs acting on the Respiratory system through a case	7
26.3	Analyse Adverse Drug Reaction in a polypharmacy patient through a case scenario	6
26.4	Discussion on Emergency Pharmacology through a case scenario of anaphylaxis management	6
27.1	Practice of Network Pharmacology	10
27.2	A mini-project on network pharmacology	3
27.3	Presentation of observations of analysis of Reverse Pharmacology in selected cases.	10
27.4	Interpret Reverse pharmacology with a systems biology approach.	3
28.1	Identification of the Root cause, affected personnel roles, and suggest corrective and preventive measures through Case Study Discussion on GMP Violation	6
28.2	Documentation of a personal record of pharmacy personnel	6
28.3	Inspection of Packaging Materials to check their compliance with quality specifications	6
28.4	Calibration of Analytical Instruments	2
28.5	QA Documentation audit	6
29.1	Identification of Adverse drug reaction in selected case and .documentmentation cases of Adverse Drug Reaction	7
29.2	Experience about Basic Health Screening at community screening	6
29.3	Discuss on Multidisciplinary Integration for TDM(Therapeutic Drug Monitoring) decision making	7
29.4	Development of Standard Therapeutic Guidelines	6
30.1	Conduction of Dry heat sterilization practice	6
30.2	Simulation Activity for Aseptic Practices	6

30.3	Real-life case studies on spoilage outbreaks and preservative failures	7
30.4	Observing and detecting Spoilage of Pharmaceutical Product in Real Time	7
31.1	Case Law analysis on the Factory Act	4
31.2	Technical Report to DTAB: Reporting Adverse Drug Reactions (ADRs)	4
31.3	Identification of Misbranded/Spurious Drugs and Cosmetics	4
31.4	Application for GMP certification	4
31.5	Development and Licensing of Proprietary Herbal/ Ayurvedic Formulations	5
31.6	Label Compliance Check	5
31.7	Product Label Designing as per D&C Act	4
31.8	Analysis of Landmark Judgments under the NDPS Act	5
31.9	Objectionable Advertisements: Case Studies and Report	4
32.1	Creating an elevator pitch for a startup idea	2
32.2	Conducting market research for a start-up, including survey design and analysis	4
32.3	Navigating a Startup's Early Days: A Case Study-Based Role-Play	2
32.4	Designing of an application to Patent the formulation process	3
32.5	Identification of the patentability of a product	2

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
AYPG-RB	4	100 x 4 Papers = 400	400	800

6 B : Scheme of Assessment (Formative and Summative Assessment)**Credit frame work**

AYPG-RB 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 : Semester 2 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 (Rasashastra(Iatrochemistry) – Principles and Practices)						
M1 Chronological Development and Taxonomy of Rasa Dravyas	2	60		50		
M2 Puta and Samskara (Transformative processes of drug manufacturing)	2	60		50		
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)						
M9 Scientific fundamentals of Ayurvedic Pharmaceutical preparations	2	60		50		
M10 Principles of pharmaceutical formulation	2	60		50		
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)						
M17 Guidelines for administration of Rasoushadhi in clinical Practice	2	60		50		

M18 Prayogika Bhaishajya Kalpana(Clinical application of Pharmaceutical products)	2	60		50		
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)						
M25 Artificial intelligence in drug development and Pharmacogenetics; Pharmacogenomics	2	60		50		
M26 Pharmacology	2	60		50		
	16	480		400		
Semester No : 4						
Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)						
M3 Parada (Mercury) and Its Processing: Ancient wisdom and Scientific advances	2	60		50		
M4 Maharasa Dravya, its processing and utility	2	60		50		
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)						
M11 Mana Paribhasha (Metrology in Ayurvedic Pharmaceutical preparation)	2	60		50		
M12 Process validation Protocol	2	60		50		
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)						
M19 SOP and clinical application of Chaturvidha Rasayana	3	90		75		
M20 SOP and Clinical application of Ayaskriti, Louha, and Mandura Kalpa	1	30		25		
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)						
M27 Network pharmacology & Reverse Pharmacology	2	60		50		
M28 Pharmaceutical Quality Assurance	2	60		50		
	16	480		400		
Semester No : 5						
Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)						
M5 Critical appraisal of Uparasa Dravya and Sadharana Rasa Dravya	2	60		50		
M6 Critical appraisal of Dhatu and Updhatu	2	60		50		
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)						

M13 Krutanna (Ayurvedic Food Preparations)	2	60		50		
M14 Ayurvedic Formulations for Holistic Wellbeing, Vitality and Body Care	2	60		50		
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)						
M21 Clinical application of Rasoushadhi according to Srotas and in selected challenging clinical conditions	1	30		25		
M22 Yogas from different Kalpanas	3	90		75		
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)						
M29 Pharmacy Practice	2	60		50		
M30 Pharmaceutical Microbiology	2	60		50		
	16	480		400		
Semester No : 6						
Paper No : 1 (Rasashastra(Iatrochemistry) – Principles and Practices)						
M7 Sudha Varga, Sikata Varga, Visha Varga Dravyas	3	90		75		
M8 Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana	1	30		25		
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)						
M15 Disease condition specific selection of formulation	2	60		50		
M16 Current trends in Ayurvedic Pharmaceutical Industry.	2	60		50		
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)						
M23 SOP and clinical applications of Churna Kalpana(Powder dosage forms)	3	90		75		
M24 Therapeutic significance of Topical dosage forms	1	30		25		
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)						
M31 Regulatory Acts and Rules applicable to Ayurvedic Drugs	3	90		75		
M32 Entrepreneurship and Start-Ups	1	30		25		
	16	480		400		

$$\text{MGP} = \frac{(\text{Number of Notional learning hours attended in a module}) \times (\text{Marks obtained in the modular assessment})}{(\text{Total number of Notional learning hours in the module}) \times (\text{Maximum marks of the module})} \times 100$$

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 Rasashastra(Iatrochemistry) – Principles and Practices		
A S.No	B Module number and Name	C MGP
1	M1.Chronological Development and Taxonomy of Rasa Dravyas	C1
2	M2.Putra and Samskara (Transformative processes of drug manufacturing)	C2
Paper No : 2 Exposition of Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
3	M9.Scientific fundamentals of Ayurvedic Pharmaceutical preparations	C3
4	M10.Principles of pharmaceutical formulation	C4
Paper No : 3 Standardization and clinical Utility of Ayurvedic formulations		
A S.No	B Module number and Name	C MGP
5	M17.Guidelines for administration of Rasoushadhi in clinical Practice	C5
6	M18.Prayogika Bhaishajya Kalpana(Clinical application of Pharmaceutical products)	C6
Paper No : 4 Regulatory aspects and recent trends in Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
7	M25.Artificial intelligence in drug development and Pharmacogenetics; Pharmacogenomics	C7
8	M26.Pharmacology	C8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 4		
Paper No : 1 Rasashastra(Iatrochemistry) – Principles and Practices		
A	B	C

S.No	Module number and Name	MGP
1	M3.Parada (Mercury) and Its Processing: Ancient wisdom and Scientific advances	C1
2	M4.Maharasa Dravya, its processing and utility	C2
Paper No : 2 Exposition of Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
3	M11.Mana Paribhasha (Metrology in Ayurvedic Pharmaceutical preparation)	C3
4	M12.Process validation Protocol	C4
Paper No : 3 Standardization and clinical Utility of Ayurvedic formulations		
A S.No	B Module number and Name	C MGP
5	M19.SOP and clinical application of Chaturvidha Rasayana	C5
6	M20.SOP and Clinical application of Ayaskriti, Louha, and Mandura Kalpa	C6
Paper No : 4 Regulatory aspects and recent trends in Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
7	M27.Network pharmacology & Reverse Pharmacology	C7
8	M28.Pharmaceutical Quality Assurance	C8
	Semester Grade point Average (SGPA)	$(C1+C2+C3+C4+C5+C6+C7+C8) / \text{Number of modules}(8)$
Semester No : 5		
Paper No : 1 Rasashastra(Iatrochemistry) – Principles and Practices		
A S.No	B Module number and Name	C MGP
1	M5.Critical appraisal of Uparasa Dravya and Sadharana Rasa Dravya	C1
2	M6.Critical appraisal of Dhatu and Updhatu	C2
Paper No : 2 Exposition of Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP

3	M13.Krutanna (Ayurvedic Food Preparations)	C3
4	M14.Ayurvedic Formulations for Holistic Wellbeing, Vitality and Body Care	C4
Paper No : 3 Standardization and clinical Utility of Ayurvedic formulations		
A S.No	B Module number and Name	C MGP
5	M21.Clinical application of Rasoushadhi according to Srotas and in selected challenging clinical conditions	C5
6	M22.Yogas from different Kalpanas	C6
Paper No : 4 Regulatory aspects and recent trends in Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
7	M29.Pharmacy Practice	C7
8	M30.Pharmaceutical Microbiology	C8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 6		
Paper No : 1 Rasashastra(Iatrochemistry) – Principles and Practices		
A S.No	B Module number and Name	C MGP
1	M7.Sudha Varga, Sikata Varga, Visha Varga Dravyas	C1
2	M8.Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana	C2
Paper No : 2 Exposition of Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
3	M15. Disease condition specific selection of formulation	C3
4	M16.Current trends in Ayurvedic Pharmaceutical Industry.	C4
Paper No : 3 Standardization and clinical Utility of Ayurvedic formulations		
A S.No	B Module number and Name	C MGP
5	M23.SOP and clinical applications of Churna Kalpana(Powder dosage forms)	C5

6	M24.Therapeutic significance of Topical dosage forms	C6
Paper No : 4 Regulatory aspects and recent trends in Ayurvedic Pharmaceutics		
A S.No	B Module number and Name	C MGP
7	M31.Regulatory Acts and Rules applicable to Ayurvedic Drugs	C7
8	M32.Entrepreneurship and Start-Ups	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 Ayurveda Examination AYPG-RB 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 (Rasashastra(Iatrochemistry) – Principles and Practices)				
(M-1)Chronological Development and Taxonomy of Rasa Dravyas (Marks: Range 5-20)				
1	(U-1) Chronological Development and Overview of Rasashastra	Yes	Yes	Yes
2	(U-2) Taxonomy of Rasadravyas	Yes	Yes	Yes
3	(U-3) Geological/mineralogical identification of Rasadravyas	Yes	Yes	Yes
4	(U-4) Overview of Sandigdha, Anupalabdha, Krutrima, and Pratinidhi Dravyas in the Context of Rasa Dravya	Yes	Yes	Yes
(M-2)Putra and Samskara (Transformative processes of drug manufacturing) (Marks: Range 5-20)				
1	(U-1) Putra and Law of thermodynamics	Yes	Yes	Yes
2	(U-2) Concept, understanding, application, SOPs and chemical changes of Jarana, Amritikarana and Lohitikarana	Yes	Yes	Yes
3	(U-3) Concept, understanding, application, SOPs (Standard Operating Procedures) and chemical changes of Satva and Druti procedures	Yes	Yes	Yes
4	(U-4) Samskara (Principles of Transformative processes of drug manufacturing)	Yes	Yes	Yes
5	(U-5) Influence of Desha (place) and Kala(time and seasonal factors) of drug qualities	Yes	Yes	Yes
6	(U-6) Kalaprakarsha- Processing with/Effect of specific time exposure and Bhajana (processing vessel)	Yes	Yes	Yes
(M-3)Parada (Mercury) and Its Processing: Ancient wisdom and Scientific advances (Marks: Range 5-20)				
1	(U-1) Parada: Ancient and Contemporary Perspectives on Its Shodhana and Underlying Principles	Yes	Yes	Yes
2	(U-2) Parada Ashta Samskara and Ashtadasha Samskara	Yes	Yes	Yes
3	(U-3) Physico-chemical properties and pharmacology of mercury and mercurial compounds	Yes	Yes	Yes
4	(U-4) Mercury toxicity, ADR and its management	Yes	Yes	Yes
(M-4)Maharasa Dravya, its processing and utility (Marks: Range 5-20)				
1	(U-1) Maharasa Dravyas with special reference to Abhraka and Vaikranta	Yes	Yes	Yes
2	(U-2) Principles and Processing of Makshika and Vimala	Yes	Yes	Yes
3	(U-3) Principles and Processing of Shilajit and Sasyaka	Yes	Yes	Yes
4	(U-4) Principles and Processing of Chapala and Kharpara, along with physico-chemical analysis, with research updates of all Maharasa	Yes	Yes	Yes

	Dravyas Bhasma/ Shodhita products			
5	(U-5) Utility of new metals and minerals	Yes	Yes	Yes
(M-5)Critical appraisal of Uparasa Dravya and Sadharana Rasa Dravya (Marks: Range 5-20)				
1	(U-1) Principle and Processing of Uparasa Dravya	Yes	Yes	Yes
2	(U-2) Principle and Processing of Sadharana Rasa	Yes	Yes	Yes
(M-6)Critical appraisal of Dhatu and Updhatu (Marks: Range 5-20)				
1	(U-1) Principle and Processing of Dhatu / Metals	Yes	Yes	Yes
2	(U-2) Principle and Processing of Upadhatu	Yes	Yes	No
(M-7)Sudha Varga, Sikata Varga, Visha Varga Dravyas (Marks: Range 5-20)				
1	(U-1) Characterization, Pharmaceutical Processing, and Clinical Applications of Sudha Varga Dravya	Yes	Yes	Yes
2	(U-2) Characterization, pharmaceutical processing, and clinical applications of Sikata Varga Dravya	No	Yes	Yes
3	(U-3) Pharmaceutical processing, phytopharmacology and clinical applications of Visha Varga dravya	Yes	Yes	Yes
(M-8)Appraisal of Ratna and Uparatna and therapeutic significance of Pishti and Druti Kalpana (Marks: Range 5-20)				
1	(U-1) Mineralogy, Crystal chemistry, and Pharmacotherapeutics of Ratna-Uparatna Varga	No	Yes	Yes
2	(U-2) SOP and therapeutic applications of Pishti, Gandhaka Druti and Gandhaka Taila kalpana	No	Yes	Yes

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 2 (Exposition of Ayurvedic Pharmaceutics)				
(M-9)Scientific fundamentals of Ayurvedic Pharmaceutical preparations (Marks: Range 5-20)				
1	(U-1) Classical Principles of drug processing and scientific basis of Panchavidha Kashaya Kalpana	Yes	Yes	Yes
2	(U-2) Identity, Purity and Quality of Raw materials used in Ayurveda Pharmaceutics	No	Yes	No
3	(U-3) Pharmaceutical processing of drugs with its rationality	No	Yes	Yes
4	(U-4) Ayurvedic Classical Dosage Forms and their integration with modern scientific validation	Yes	Yes	Yes
(M-10)Principles of pharmaceutical formulation (Marks: Range 5-20)				
1	(U-1) Principles of Samskara (transformative processes of drug manufacturing) in relation to drug development	No	Yes	Yes
2	(U-2) Rationality behind Composition of Formulations	No	Yes	Yes
3	(U-3) Principles and designing of various dosage forms	No	Yes	No
4	(U-4) Principles of Prakshep dravyas (Pharmaceutical Additives)	No	Yes	No
5	(U-5) Principles of Potency and Efficacy enhancement	Yes	Yes	Yes
(M-11)Mana Paribhasha (Metrology in Ayurvedic Pharmaceutical preparation) (Marks: Range 5-15)				
1	(U-1) Mana Paribhasha (Classical system of measurement)	No	Yes	No
2	(U-2) Standard Units of Measurement	No	Yes	No
3	(U-3) Volumetric Vs Gravimetric Methods	No	Yes	Yes
4	(U-4) Rationality of Proportion of Ingredients in Ayurvedic formulations	No	Yes	Yes
5	(U-5) Bulk production of Ayurvedic Formulations	No	Yes	Yes
(M-12)Process validation Protocol (Marks: Range 5-20)				
1	(U-1) Pharmaceutical Preparation process: Classical Dosage forms	Yes	No	Yes
2	(U-2) Pharmaceutical Preparation process: Recent advances of Dosage forms	Yes	Yes	Yes
3	(U-3) Novel Dosage and drug delivery Forms	Yes	Yes	Yes
(M-13)Krutanna (Ayurvedic Food Preparations) (Marks: Range 5-20)				
1	(U-1) Classification of food substances and Formulations	Yes	Yes	Yes
2	(U-2) Customized food for treatment	Yes	Yes	Yes

3	(U-3) Ayurvedic Food Industry	No	Yes	Yes
4	(U-4) Food processing technology traditional and modern methods	No	Yes	No
(M-14)Ayurvedic Formulations for Holistic Wellbeing, Vitality and Body Care (Marks: Range 5-15)				
1	(U-1) Rasayana-Personalized Rejuvenation Formulations	No	Yes	Yes
2	(U-2) Ayurvedic based cosmetic preparation	No	Yes	No
(M-15) Disease condition specific selection of formulation (Marks: Range 5-15)				
1	(U-1) Application of Yukti Pramana in Formulation Selection	No	Yes	Yes
2	(U-2) Selection of formulations for Speciality practice in Ayurveda	No	No	No
3	(U-3) Routes of Drug Administration	No	Yes	No
4	(U-4) Designing formulations for Shodhana and Shamana Chikitsa	No	Yes	Yes
5	(U-5) Innovation in Ayurvedic Formulations	No	Yes	No
(M-16)Current trends in Ayurvedic Pharmaceutical Industry. (Marks: Range 5-15)				
1	(U-1) Key Competencies Required for Employment in Pharmacy	No	No	No
2	(U-2) Internship/ Visits to GMP certified Pharmacies	No	No	Yes
3	(U-3) Quality Assurance and Quality Control (QAQC) Laboratory Training	No	Yes	No

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 3 (Standardization and clinical Utility of Ayurvedic formulations)				
(M-17)Guidelines for administration of Rasoushadhi in clinical Practice (Marks: Range 5-20)				
1	(U-1) Concept of Rasa chikitsa and significance of Rasoushadhi	No	Yes	No
2	(U-2) Concept of Kshetrikarana and its significance prior to administration of Rasoushadhi	Yes	Yes	No
3	(U-3) Pathya -Apathya during Rasayoga Sevana	No	Yes	No
4	(U-4) Safety and toxicity of Rasoushadhi	No	Yes	No
5	(U-5) Heavy metal toxicity and chelation therapy	Yes	No	Yes
(M-18)Prayogika Bhaishajya Kalpana(Clinical application of Pharmaceutical products) (Marks: Range 5-20)				
1	(U-1) Aushadha Sevana Kala (Time of administration of drug)	Yes	No	Yes
2	(U-2) Concept and scientific basis of Anupana	Yes	Yes	No
3	(U-3) Matra (Posology)	No	Yes	No
4	(U-4) Concept of drug repurposing	Yes	Yes	No
(M-19)SOP and clinical application of Chaturvidha Rasayana (Marks: Range 5-20)				
1	(U-1) Standard Operating Procedure (SOP) and Clinical Application of Khalveeya Rasayana	Yes	Yes	Yes
2	(U-2) SOP and clinical application of Parpati Rasayana	Yes	Yes	Yes
3	(U-3) SOP and clinical application of Pottali Rasayana	Yes	Yes	Yes
4	(U-4) SOP and clinical application of Kupipakwa Rasayana	Yes	Yes	Yes
(M-20)SOP and Clinical application of Ayaskriti, Louha, and Mandura Kalpa (Marks: Range 5-15)				
1	(U-1) SOP and clinical application of Ayaskriti	No	Yes	Yes
2	(U-2) SOP and clinical application of Louha kalpa	No	Yes	Yes
3	(U-3) SOP and Clinical application of Mandura Kalpa	No	Yes	Yes
(M-21)Clinical application of Rasoushadhi according to Srotas and in selected challenging clinical conditions (Marks: Range 5-20)				
1	(U-1) Clinical application of Rasoushadhis specific to Srotas	Yes	Yes	Yes
2	(U-2) Clinical application of Rasoushadhi in emergency conditions	Yes	Yes	Yes
3	(U-3) Rasoushadhi in specific, clinically challenging conditions	Yes	Yes	No
(M-22)Yogas from different Kalpanas (Marks: Range 5-15)				

1	(U-1) SOP of Vati, Gutika, Guggulu and Varti Kalpas and their therapeutic applications	No	Yes	Yes
2	(U-2) SOP and Clinical applications of Avaleha and Khanda kalpana	No	Yes	Yes
3	(U-3) SOP of Sneha Kalpana and its clinical significance	No	Yes	Yes
4	(U-4) SOP and clinical applications of Arka and Dravakam in various disorders	No	Yes	Yes
5	(U-5) SOP and therapeutic applications of Sandhana Kalpana	No	Yes	Yes

(M-23)SOP and clinical applications of Churna Kalpana(Powder dosage forms) (Marks: Range 5-15)

1	(U-1) SOP and clinical utility of Churna Kalpana	No	Yes	No
2	(U-2) Standardization, analytical profiling, and clinical application of Kshara	No	Yes	Yes
3	(U-3) Lavana Kalpana with special reference to pharmaceutico-analytical aspects and therapeutic attributes	No	Yes	No
4	(U-4) Satva Kalpana SOP and clinical significance	No	Yes	Yes
5	(U-5) Therapeutic attributes of Masi Kalpana	No	Yes	Yes

(M-24)Therapeutic significance of Topical dosage forms (Marks: Range 5-20)

1	(U-1) Ophthalmic, Otic, and Buccal dosage forms and their clinical applications	Yes	Yes	Yes
2	(U-2) Standardisation of Lepa and Malahara preparations and its application in various disorders	No	Yes	Yes
3	(U-3) Standard Operating Procedure (SOP) for Upanaha, Dhupa, Dhumapana, and Avachurnana Kalpa and their therapeutic applications	No	Yes	No

S.No	List of Module/Unit	ABQ	SAQ	LAQ
Paper No : 4 (Regulatory aspects and recent trends in Ayurvedic Pharmaceutics)				
(M-25)Artificial intelligence in drug development and Pharmacogenetics; Pharmacogenomics (Marks: Range 5-20)				
1	(U-1) Role of Artificial intelligence in drug development	No	Yes	Yes
2	(U-2) Types of software used in Artificial intelligence	No	Yes	Yes
3	(U-3) 3D printed drug delivery system	No	Yes	Yes
4	(U-4) Pharmacogenetics and Pharmacogenomics	No	Yes	Yes
5	(U-5) Pharmacogenomics in drug discovery	Yes	Yes	Yes
(M-26)Pharmacology (Marks: Range 5-15)				
1	(U-1) Introduction to Pharmacology	No	Yes	Yes
2	(U-2) Pharmacokinetics, therapeutic index, and drug interactions	No	Yes	Yes
3	(U-3) Pharmacology of drugs that act on the peripheral nervous system	No	Yes	Yes
4	(U-4) Pharmacology of drugs that act on the central nervous system I	No	Yes	Yes
5	(U-5) Pharmacology of drugs that act on the central nervous system II	No	Yes	Yes
(M-27)Network pharmacology & Reverse Pharmacology (Marks: Range 5-20)				
1	(U-1) Network Pharmacology	No	Yes	Yes
2	(U-2) Reverse Pharmacology	No	Yes	Yes
(M-28)Pharmaceutical Quality Assurance (Marks: Range 5-15)				
1	(U-1) Quality Assurance and Quality Management concepts	No	Yes	Yes
2	(U-2) Personnel Responsibilities	No	Yes	Yes
3	(U-3) Containers, Packing materials	No	Yes	Yes
4	(U-4) Good Laboratory Practices	No	Yes	Yes
5	(U-5) Document maintenance in pharmaceutical industry	No	Yes	Yes
(M-29)Pharmacy Practice (Marks: Range 5-15)				
1	(U-1) Hospital Pharmacy and Community Pharmacy	No	Yes	Yes
2	(U-2) Therapeutic Drug Monitoring	No	Yes	Yes
3	(U-3) Pharmacy and therapeutic committee	No	Yes	Yes
(M-30)Pharmaceutical Microbiology (Marks: Range 5-20)				

1	(U-1) Introduction to microbes with applications of sterilization	No	Yes	Yes
2	(U-2) Sources of contamination	No	Yes	Yes
3	(U-3) Types of spoilage and use of antimicrobial agents	Yes	Yes	Yes
(M-31)Regulatory Acts and Rules applicable to Ayurvedic Drugs (Marks: Range 5-15)				
1	(U-1) Chapter I of the Drugs and Cosmetics Act, 1940 and Rules 1945	No	Yes	Yes
2	(U-2) Chapter II - Regulatory Bodies	No	Yes	Yes
3	(U-3) Chapters III, IV, and IV-A - Regulation of Drugs and Cosmetics	No	Yes	Yes
4	(U-4) Schedules to Drugs and Cosmetics Rules related to ASU drugs and cosmetics	No	Yes	Yes
5	(U-5) Pharmaceutical observation of drugs and cosmetics ASU drugs	No	Yes	Yes
6	(U-6) Miscellaneous Regulatory Acts related to drugs and cosmetics	No	Yes	Yes
(M-32)Entrepreneurship and Start-Ups (Marks: Range 5-20)				
1	(U-1) Entrepreneurship and Startup	Yes	Yes	Yes
2	(U-2) Process of entrepreneurship development	No	Yes	No
3	(U-3) Project Proposal for new Invention/startup	No	Yes	Yes
4	(U-4) Intellectual Property Rights and Patents	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 1. Pharmaceutical preparation (50 marks) 2. Analytical practical (50 marks)	100
2	Minor practical: 1. Pharmaceutical preparation that takes less than 30 minutes (25 marks) 2. Analytical practical: An analytical practical that takes less than 30 minutes to perform (25 marks)	50
3	Spotters: • A total of 25 samples are to be identified, and specified questions related to the samples are to be answered (50 marks) • Raw materials (Metals, Minerals, Visha Dravya): 05 • Finished products (Rasoushadhi and Kashthoushadhi): 05 • Manufacturing equipment (end runner, edge runner, granulator, pulverizer, homogenizer, double cone blender, tablet punching machine etc.: 05 • Analytical equipment (digital pH meter, refractometer, tablet disintegration apparatus, trinocular microscope etc): 05 • Analytical study report (XRD graph, TLC plates to calculate Rf value, petrology microscope slides, EDAX graph etc): 05	50
4	Assessing teaching ability: The model class is to be taken on the given topic	20
5	Assessing presentation skills (20 marks): A summary of the dissertation work needs to be presented within a stipulated time along with question and answer sessions	20

6	Viva: A structured viva voce exam is carried out by 4 examiners (20 marks/each examiner)	80
7	Dissertation Viva	40
8	Logbook (Activity record)	20
9	Practical record	20
Total Marks		400

Reference Books/ Resources

S.No	References
1	Artificial Intelligence in Drug Discovery, Authors: Nathan Brown ; Publisher: Royal Society of Chemistry (2020)
2	Deep Learning for the Life Sciences, Authors: Bharath Ramsundar, Peter Eastman, Patrick Walters, Vijay Pande, Publisher: O'Reilly Media (2019)
3	Artificial Intelligence in Healthcare, Authors: Lei Xing, James G. Anderson; Publisher: Academic Press (2020)
4	Computational Drug Discovery and Design, Editor: Riccardo Baron Publisher: Humana Press (Methods in Molecular Biology series)
5	Essential Medical Pharmacology KD Tripathi
6	Goodman & Gilman's: The Pharmacological Basis of Therapeutics Authors: Laurence Brunton et al.
7	Pandit Sudarshan Shastri Trivedi; Rasa Raj Mahodadhi, Thakur Prasad Pustak Bhandar, Varanasi
8	Rang & Dale's Pharmacology, Authors: James M. Ritter, Rod Flower, Graeme Henderson, Yoon Kong Loke, David MacEwan
9	Clinical Pharmacology, Authors: Peter N. Bennett, Morris J. Brown
10	Network Pharmacology, Authors: D. Kumar, D. M. Reddy
11	Network Medicine: Complex Systems in Human Disease and Therapeutics Authors: Joseph Loscalzo, Albert-László Barabási
12	Reverse Pharmacology: Integrating Traditional Knowledge with Modern Drug Discovery Editors: Ashwini kumar Raut and Vijay Pawar
13	Drug Discovery from Herbal Medicines: A Reverse Pharmacology Approach Author: Editors vary; look for collections edited by experts in pharmacology and herbal medicine
14	Quality Assurance of Pharmaceuticals: A Compendium of Guidelines and Related Materials, Published by: World Health Organization (WHO), Volume 1 & 2.
15	Pharmaceutical Quality Assurance, Author: Manohar A. Potdar, Publisher: Nirali Prakashan
16	GMP/ISO Quality Audit Manual for Pharmaceuticals, Author: Leonard Steinborn
17	ICH Quality Guidelines Handbook: ICH Q8, Q9, Q10, Q11, and Q12, Available from: Regulatory training providers or ICH website (as free guidelines)
18	Good Manufacturing Practices for Pharmaceuticals; Author: Sidney H. Willig, James R. Stoker, Edition: Latest (6th edition or later)
19	Fundamentals of Community Pharmacy Practice by Nagappa, Mateti & Naik
20	Dispensing and Community Pharmacy by Gayathri Patil & Harpal Singh
21	Basic Skills in Interpreting Laboratory Data by Scott L. T. (ASHP)

22	Goodman & Gilman's The Pharmacological Basis of Therapeutics
23	Textbook of Microbiology; Author: Ananthanarayan and Paniker
24	Industrial Microbiology; Author: A.H. Patel
25	Pharmaceutical Microbiology; Author: Dr. R. R. Dhotre
26	Essentials of Pharmaceutical Microbiology; Author: S. P. Vyas and V. K. Dixit
27	Laboratory Manual of Microbiology; Author: K.R. Aneja
28	GOVERNMENT OF INDIA MINISTRY OF HEALTH AND FAMILY WELFARE (Department of Health) THE DRUGS AND COSMETICS ACT AND RULES ; THE DRUGS AND COSMETICS ACT, 1940 (23 OF 1940) (As amended up to the 31 st December, 2016) and THE DRUGS AND COSMETICS RULES, 1945 (As amended up to the 31st December, 2016)
29	Legal status of Ayurvedic, siddha and Unani medicines published by Govt. of India Department of AYUSH Ministry of Health and Family Welfare Pharmacopoeial Laboratory for Indian Medicines GHAZIABAD- Dr. D.R. Lohar, M.Sc., Ph.D. Director
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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		

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