Competency-Based Dynamic Curriculum for MD/ MS Unani

(PRESCRIBED BY NCISM)

Semester III-VI

Ilmul Saidla

(Materia Medica, Pharmaceutics and Clinical Pharmacy)

(SUBJECT CODE : UNIPG-IS)

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

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BOARD OF UNANI, SIDDHA AND SOWA-RIGPA

NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE

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Preface

Ilmul Saidla wa Murakkabāt علم الصیدلہ و مرکبات is a vital discipline within the Unani system of medicine that encompasses the principles of drug formulation, processing, standardization, quality assurance, and pharmaceutical management. Rooted in classical Unani wisdom and aligned with modern pharmaceutical needs, this field plays a critical role in healthcare, industry, and education. The MD program in Ilmul Saidla wa Murakkabāt, launched in 2010, has evolved significantly in response to global demands, technological advancements, and the need for standardized, research-driven Unani formulations. The revised curriculum represents a thoughtful integration of classical knowledge with contemporary advancements in pharmaceutical sciences, aiming to produce professionals who are both tradition-rooted and innovation-ready.

This competency-based dynamic curriculum (CBDC) focuses on imparting core competencies through a structured semester-wise model, combining theory, practical training, and experiential learning. It introduces new modules like pharmaceutical advancements, Itriyat (perfumery), cosmetology, bioinformatics, artificial intelligence, and regulatory affairs, while reinforcing classical foundations such as Qiwa, Mizaj, and Tadbeer. The curriculum emphasizes translational education from maqasid-e-tib (objectives of medicine) to application, enabling students to explore standardization, experimental pharmacology, and industrial pharmacy practices. Field visits, industry internships, and research projects are incorporated to foster a deeper understanding of Unani drug development and commercialization.

This curriculum is designed to prepare students for diverse roles in academia, the pharmaceutical industry, research and development, public health, and entrepreneurship. It offers a comprehensive platform to develop skilled Unani pharmacy professionals who are competent in formulation, regulatory compliance, and evidence-based validation. By blending the strengths of classical Ilmul Saidla with modern scientific tools, this syllabus aspires to nurture graduates who will uphold the legacy of Unani medicine and contribute meaningfully to its global acceptance. The success of this initiative depends on collaborative efforts from educators, institutions, and policymakers to ensure its robust implementation and sustained relevance.

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Competency-Based Dynamic Curriculum for MD/ MS Unani

Ilmul Saidla (UNIPG-IS)

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 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)			
M 1 Principles and Application of Pharmaceutical Processing - I اعمال صیدلہ کے اصول اور اطلاق	2	60	50
M 2 Principles and Application of Pharmaceutical Processing - II اصول دواسازی اور ان کا اطلاق	2	60	50
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)			
M 9 Quality Assurance, Standardisation and Good Practices in Unani Drugs یونانی ادویہ کی ضمانت اوصاف، معیار بندی اور صنعت جیدہ	2	60	50
M 10 Extraction of Herbal Drugs تعصیر ادویہ	2	60	50
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)			
M 19 General Considerations in Experimental Pharmacology تجرباتی علم الادویہ کے عمومی نکات	2	60	50
M 20 General Introduction to Pharmacognosy علم وصف العقاقیر کا عمومی تعارف	2	60	50
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)			
M 27 Unani Cosmetology یونانی تزئینیات	2	60	50

M 28 Production of Unani cosmetics یونانی صنعت تزئینیات	2	60	50
Semester No : 4			
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)			
M 3 Formulation of Unani Pharmaceutical Dosage Form یونانی اشکال ادویہ کی ترکیب	2	60	50
M 4 Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine یونانی دواسازی میں ترسیلِ ادویہ کے جدید نظام کا انضمام	2	60	50
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)			
M 11 Physico-chemical Evaluation of Unani Drugs-I یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ	2	60	50
M 12 Physico-chemical Evaluation of Unani Drugs-II یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ	2	60	50
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)			
M 21 Laboratory Animals used in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے تجرباتی جانور	2	60	50
M 22 Identification of crude drugs خام ادویہ کی شناخت	2	60	50
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)			
M 29 Regulatory Framework for Unani Drugs قوانین وضوابط برائے یونانی ادویہ	2	60	50
M 30 Other regulatory provisions in relation to Unani Drugs یونانی ادویہ کے حوالے سے دیگر قانونی ضوابط	2	60	50
Semester No : 5			
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)			
M 5 Conventional Pharmaceutical Dosage Forms روایتی اشکال ادویہ	3	90	75

M 6 Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms یونانی اور جدید اشکال ادویہ میں اساس، حامل مرکبات اور منظور شدہ غیر فعال اجزاء	1	30	25
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)			
M 13 Chromatographic Techniques کرومیٹوگرافک تکنیکس	2	60	50
M 14 Spectroscopic Techniques اسپیکٹروسکوپک تکنیکس	2	60	50
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)			
M 23 In Vitro Experimental Studies and Alternative to Animal Experimentation ان وٹرو تجرباتی مطالعات اور حیوانات کے متبادل	2	60	50
M 24 Bioassay and Toxicity studies حیاتی تعین و مطالعہ سمیت	2	60	50
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)			
M 31 Intellectual Property of Unani Drugs یونانی دوائیں اور حق دانشوری	2	60	50
M 32 Pharmacovigilance and use of Artificial Intelligence in Unani Pharmacy (فارماکو ویجلنس اور یونانی فارمیسی میں مصنوعی ذہانت کا استعمال)	2	60	50
Semester No : 6			
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)			
M 7 Integration of technological advancements in Unani Pharmaceutical Sciences یونانی دواسازی میں تکنیکی پیش رفت کا انضمام	2	60	50
M 8 Packaging Material & Production Management in Unani Pharmaceutics (یونانی دواسازی میں پیکیجنگ مٹیریل اور تنظیم صنعت)	2	60	50
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)			
M 15 Determination of contaminants in Unani drugs یونانی ادویہ میں آلودگیوں کا تعین	1	30	25
M 16 Standardisation of compound drugs ادویہ مرکبہ کی معیار بندی	1	30	25

M 17 Shelf-life & Stability Studies of Unani Drugs یونانی ادویہ کی مدت حیات اور استحکامی مطالعے	1	30	25
M 18 Analytical/Quality testing laboratory as per Drugs Rules, 1945 ادویہ قوانین 1945 کے مطابق تجزیہ اوصاف کی تجربہ گاہ	1	30	25
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)			
M 25 In-Vivo Animal Experimentation studies حیوانات پر کیے جانے والے تجرباتی مطالعات/جاندار نسیج	2	60	50
M 26 Secondary metabolites of medicinal plants طبی نباتات کے ثانوی استحالاتی مرکبات	2	60	50
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)			
M 33 Unani Pharmaceutical Management، یونانی صنعت دواسازی کی تنظیم	2	60	50
M 34 Commercialization and Marketing of Unani drugs یونانی دواوں کی (تجارت اور خرید و فروخت	2	60	50
	64	1920	1600

Credit frame work

UNIPG-IS consists of 34 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 Unani 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 syllabus24uni@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-19 | 2 Crs M-20 | 2 Crs	M-27 | 2 Crs M-28 | 2 Crs	**16**
Semester 4	M-3 | 2 Crs M-4 | 2 Crs	M-11 | 2 Crs M-12 | 2 Crs	M-21 | 2 Crs M-22 | 2 Crs	M-29 | 2 Crs M-30 | 2 Crs	**16**
Semester 5	M-5 | 3 Crs M-6 | 1 Crs	M-13 | 2 Crs M-14 | 2 Crs	M-24 | 2 Crs M-23 | 2 Crs	M-32 | 2 Crs M-31 | 2 Crs	**16**
Semester 6	M-7 | 2 Crs M-8 | 2 Crs	M-16 | 1 Crs M-17 | 1 Crs M-18 | 1 Crs M-15 | 1 Crs	M-25 | 2 Crs M-26 | 2 Crs	M-33 | 2 Crs M-34 | 2 Crs	**16**
Credits	**16**	**16**	**16**	**16**	**64**

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

Semester VI University examination – 800 Marks

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

Course Code and Name of Course

Course code	Name of Course
UNIPG-IS	Ilmul Saidla (Materia Medica, Pharmaceutics and Clinical Pharmacy)

Table 1 : Course learning outcomes and mapped Program learning outcomes

CONo	A1 Course learning Outcomes (CO) UNIPG-IS At the end of the course UNIPG-IS, the students should be able to	B1 Course learning Outcomes mapped with program learning outcomes.
CO1	Demonstrate advanced knowledge of principles and classical dosage forms of Unani pharmacy applying them in academia, industry, and pharmacy practice.	PO1,PO4,PO5,PO6,PO8
CO2	Acquire and utilize necessary skills and modern technology for drug processing, manufacturing, commercialization and optimization of Unani Drugs and Cosmetics exploring opportunities for entrepreneurship	PO1,PO4,PO6
CO3	Engage in research, product development, focusing on new dosage forms and innovative formulations, integrating traditional Unani knowledge with modern pharmaceutical technology.	PO1,PO4,PO5,PO7,PO8
CO4	Interpret and apply national and international regulatory frameworks, pharmacopoeias for Unani medicines, ensuring compliance in drug development, pharmaceutical industry, and marketing.	PO4,PO5,PO8
CO5	Develop SOPs and standardise Unani formulations using advanced techniques and establish methods for quality control (QC) and quality assurance (QA).	PO1,PO4,PO5,PO7,PO8
CO6	Conduct process validation and implement production management strategies for the manufacturing of Unani Drugs, ensuring sustainability and efficiency.	PO4,PO5,PO7,PO8
CO7	Contribute to the development of industry guidelines and protocols for Unani drugs manufacturing, aligning them with Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP).	PO5,PO8

CO8	Extrapolate the principles of pharmacovigilance and abreast with pharmacognostical, phytochemical evaluation and pre-clinical studies to assess safety and efficacy of Unani drugs.	PO1,PO4,PO5,PO7,PO8

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

Paper No : 1 PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA						
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**
	M-1 Principles and Application of Pharmaceutical Processing - I اعمال صیدلہ کے اصول اور اطلاق The module 'Principles and Application of Pharmaceutical Processing - I' provides an in-depth understanding of essential pharmaceutical processing techniques in Unani medicine. It covers fundamental principles, theoretical concepts, and practical applications of various pharmaceutical processes, ensuring a comprehensive grasp of formulation and manufacturing techniques. The module guides about size reduction, size separation, mixing, homogenization, and drying of Unani drugs emphasizing their significance in Unani pharmaceutical preparations. **• M 1U 1 Size Reduction of Unani drugs یونانی ادویہ کی تقصیر اجزاء** 1.1.1 Definition and objectives of size reduction	2	10	20	30	60

	1.1.2 Factors affecting the size reduction 1.1.3 Mechanisms of size reduction- Cutting, Compression, Impact and Attrition 1.1.4 Equipment used for size reduction- Cutter Mill, Runner Mills, Hammer Mill, Pulveriser, Roller Mills, Ball Mill and Fluid Energy Mill **• M 1U 2 Size Separation of Unani drugs حجم کے لحاظ سے یونانی ادویہ کے اجزاء کی تفریق** 1.2.1 Introduction and application of size separation 1.2.2 Sieving and related equipment -pharmaceutical sieves, sieve shaker, sifter 1.2.3 Grading of powders 1.2.4 Other techniques of size separation like sedimentation, elutriation and cyclone methods **• M 1U 3 Mixing & Homogenization of different dosage forms of Unani Medicines مختلف یونانی اشکال ادویہ کی باہم آمیزش اور یکسانیت** 1.3.1 Introduction, advantages and application of mixing & homogenization 1.3.2 Factors affecting mixing, Types of mixtures and Mechanisms of mixing, demixing, powder segregation and ordered mixing 1.3.3 Mixing of solids & related equipment-tumbling mixers, agitator mixers 1.3.4 Mixing of miscible liquids, immiscible liquids and suspensions & related equipment -impeller, propeller mixers, turbine mixers, continuous mixers 1.3.5 Mixing of semisolids & related equipment– sigma blade mixer, planetary mixer, colloid mill, triple roller mill					

	1.3.6 Homogenization & homogenizers **• M 1U 4 Drying of Unani Medicines یونانی ادویہ کی تجفیف** 1.4.1 Definition, theory & objectives of drying 1.4.2 Factors affecting pharmaceutical drying 1.4.3 Drying of crude and prepared Unani drugs 1.4.4 Drying of wet solids- methods & equipment 1.4.4.1Convective drying- Tray dryer, Tunnel dryer, fluidized bed dryer 1.4.4.2 Conductive drying- vacuum oven 1.4.4.3 Radiation drying- microwave dryer 1.4.5 Drying of solutions and suspensions- methods and equipment 1.4.5.1 Freeze-drying (lyophilization)- Lyophilizer 1.4.5.2 Spray drying- Spray dryer					
	M-2 Principles and Application of Pharmaceutical Processing - II اصول دواسازی اور ان کا طلاق The module 'Principles and Application of Pharmaceutical Processing - II' provides an advanced understanding of essential pharmaceutical processing techniques relevant to Unani medicine. It focuses on clarification, filtration, extraction, sterilization, and heating processes, emphasizing their theoretical foundations and industrial applications. The module explores both conventional and modern methodologies, ensuring an integrated approach to pharmaceutical manufacturing and quality control. **• M 2U 1 Clarification & Filtration of Unani drugs یونانی ادویہ پر عمل ترویق و تصفیہ** 2.1.1 Definition & importance of filtration and clarification	2	10	20	30	60

	2.1.2 Mechanism of filtration and clarification 2.1.3 Factors affecting the rate of filtration 2.1.4 Filter media and filter aid 2.1.5 Types of filtrations and industrial filtration equipment- Gravity filters, Vacuum filters, Pressure filters 2.1.6 Centrifugation & related equipment 2.1.6.1 Introduction, importance and principles of Centrifugation 2.1.6.2 Laboratory & Industrial centrifuges **• M 2U 2 Extraction of Unani drugs یونانی ادویہ پر عمل تعصیر** 2.2.1 Introduction, scope and applications of extraction 2.2.2 Types of extracts 2.2.3 Conventional Methods of extraction & related equipment 2.2.3.1 Mechanical extraction 2.2.3.2 Liquid-Solid extraction 2.2.3.3 Liquid-Liquid extraction 2.2.3.4 Volatile oil extraction 2.2.4 Advanced extraction methods- Supercritical fluid extraction, Microwave-assisted extraction, Ultrasound-assisted extraction **• M 2U 3 Sterilization تطہیر** 2.3.1 Introduction, importance and applications of sterilization 2.3.2 Methods of sterilization - Heat sterilization, Gaseous sterilization, Radiation sterilization, Filtration sterilization, High-level disinfection					

	2.3.3 New/advanced methods of sterilization- Ultrasonication, Ultra-high Pressure sterilization • **M 2U 4 Heating Processes حرارت کاری** 2.4.1 Definition, objectives and applications of heating 2.4.2 Methods of heat transfer – conduction, convection & radiation 2.4.3 Different heat processes & related equipment- Evaporation, Sublimation, Distillation, Crystallization, Burning/Incineration and Calcination					
		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
	M-3 Formulation of Unani Pharmaceutical Dosage Form یونانی اشکال ادویہ کی ترکیب The module Formulation of 'Unani Pharmaceutical Dosage Form ' focuses on the fundamental principles and applications of dosage form design in Unani medicine. It begins with introduction to dosage form designing explaining the classification of Unani dosage forms and factors affecting	2	10	20	30	60

	dosage form designing. It provides insights into disperse systems, rheology, bioavailability, and pharmaceutical preformulation. The module emphasizes the physicochemical and formulation factors essential for optimizing drug dosage forms to ensure better therapeutic efficacy. **• M 3U 1 Introduction to formulation of dosage form اشکال ادویہ کی ترکیب کا تعارف** 3.1.1 Definition and importance of dosage form designing 3.1.2 Classification of Unani dosage forms 3.1.3 Factors affecting dosage form designing **• M 3U 2 Disperse systems نظام امتداد** 3.2.1 Definition and significance of pharmaceutical disperse systems 3.2.2 Classification of disperse systems- Molecular, Colloidal & Coarse dispersion 3.2.3 Surface-active agents 3.2.4 Gel, Suspension, Emulsion & Foams **• M 3U 3 Rheology مطالعۂ سیالیات و لزوجیت** 3.3.1 Introduction of viscosity, rheology and the flow of fluids 3.3.2 Newtonian & non-Newtonian fluids 3.3.3 Applications of rheology in pharmaceutical formulation **• M 3U 4 Bioavailability حیاتی اثر پذیری** 3.4.1 Introduction, concept and application 3.4.2 Physicochemical factors influencing bioavailability 3.4.3 Dosage form factors influencing bioavailability **• M 3U 5 Pharmaceutical preformulation دواسازی کے اعمال ماقبل ترکیب**					

	3.5.1 Introduction and importance of pharmaceutical preformulation 3.5.2 Assay development 3.5.3 Drug incompatibility 3.5.4 Different factors to be considered during preformulation– Solubility, Partitioning, Dissolution rate, Salt selection, Hygroscopicity, Physical form, Powder properties					
	M-4 Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine **یونانی دواسازی میں ترسیلِ ادویہ کے جدید نظام کا انضمام** The module 'Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine' explores advanced drug delivery approaches and their applications in Unani Pharmacy. It provides insights into modern pharmaceutical technologies, including transdermal, ocular, nasal, pulmonary, colon, rectal, and vaginal drug delivery systems, with an emphasis on their potential integration into Unani system of medicine. **• M 4U 1 Introduction to NDDS جدید نظامِ ترسیلِ ادویہ کا تعارف** 4.1.1 Definition, potential scope & applications of NDDS in Unani Medicine **• M 4U 2 Transdermal drug delivery system (TDDS) نظامِ ترسیلِ ادویہ براہ جلد** 4.2.1 Introduction, Importance, Advantages & Limitations of TDDS 4.2.2 Transdermal drug permeability enhancement 4.2.3 Basic component of TDDS and Transdermal Delivery Devices 4.2.4 Scope of TDDS in Unani Medicine **• M 4U 3 Ocular & Nasal Drug Delivery Systems نظامِ ترسیلِ ادویہ برائے عین و انف** 4.3.1 Introduction, Importance, Advantages & Limitations	2	10	20	30	60

	4.3.2 Scope of Ocular & Nasal Drug Delivery Systems in Unani Medicine **• M 4U 4 Pulmonary drug delivery system نظام ترسیل ادویہ ریوی** 4.4.1 Introduction, Importance, Advantages & Limitations 4.4.2 Pulmonary drug delivery devices 4.4.3 Scope of Pulmonary drug delivery system in Unani Medicine **• M 4U 5 Colon, rectal & vaginal drug delivery systems نظام ترسیل ادویہ برائے قولون، مقعد و مہبل** 4.5.1 Introduction, Importance, Advantages & Limitations 4.5.2 Methods and drug delivery devices for Colon, Rectum & Vagina 4.5.3 Scope in Unani Medicine					
		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
	M-5 Conventional Pharmaceutical Dosage Forms روایتی اشکال ادویہ The module 'Conventional Pharmaceutical Dosage Forms' provides a comprehensive understanding of traditional dosage forms used in Unani	3	15	30	45	90

	medicine. It introduces learners to different solid, liquid, and semi-solid formulations, pharmaceutical aerosols, modified-release systems, and dosage forms tailored for paediatric and geriatric patients. Emphasis is placed on thorough understanding of formulation techniques, manufacturing processes, equipment, and exploring the integration of advancements in Unani pharmaceutical practices. **• M 5U 1 Solid dosage forms جامد اشکال ادویہ** 5.1.1 Introduction, Advantages & Limitations of Solid Dosage Form 5.1.2 Powders- Definition, application and methods of preparing different powder forms 5.1.3 Granules- Definition, application, methods of preparing different granules and equipment used (granulators) 5.1.4 Pills and Tablets 5.1.4.1 Types, preparation methods, excipients used 5.1.4.2 Tablet tooling 5.1.4.3 Equipment used- Pill making machine, Tablet making machine 5.1.4.4 Coating materials and composition, Pill/ Tablet coating pan 5.1.4.5 Testing apparatus- Hardness testers, Disintegration time testing apparatus, Dissolution time testing apparatus, Friability test apparatus 5.1.5 Capsules 5.1.5.1 Hard & Soft capsules manufacturing 5.1.5.2 Capsule filling machines **• M 5U 2 Liquid dosage forms سیال اشکال ادویہ**					

	5.2.1 Introduction, Advantages & Limitations of Liquid Dosage Form 5.2.2 Oral liquid dosage forms 5.2.2.1 Peculiarities of oral liquid dosage forms 5.2.2.2 Definition and preparation of *Ābiyat & Murawwaq* (Clarified solutions), '*Araq* (medicinal distillate), *Sharbat* (Syrup), Oral suspension and emulsion, Linctus, Elixir 5.2.3 Topical liquid dosage forms 5.2.3.1 Peculiarities of topical liquid dosage forms 5.2.3.2 Definition and preparation of Topical solutions, *Ravghan* (oil), *Ṭilā'* (liniments), Lotions 5.2.4 Eye, Ear & Nasal preparations 5.2.4.1 Peculiarities of such dosage forms 5.2.4.2 Definition and preparation of drops **• M 5U 3 Semi solid dosage forms نیم جامد اشکال ادویہ** 5.3.1 Introduction, Advantages & Limitations of Semi Solid Dosage Forms 5.3.2 Oral Semi Solid Dosage Forms (*Qiwāmi Advia*) 5.3.2.1 Types, Methods of preparation, Peculiarities of different oral semi solid dosage forms 5.3.2.2 Equipment used such as Electric churner, Mixers, Refractometer 5.3.3 Topical Semi Solid Dosage Forms 5.3.3.1 Peculiarities of different topical semi solid dosage forms 5.3.3.2 Definition and preparation of *Marham* (ointments),*Ḍimād* (pastes) and Creams					

	• **M 5U 4 Pharmaceutical aerosols بخاری اشکال ادویہ** 5.4.1 Introduction, scope & application of Aerosols 5.4.2 Types & components of aerosol systems 5.4.3 Aerosol filling methods and machinery • **M 5U 5 Modified-release dosage forms ترمیم شدہ اخراج کی حامل اشکال ادویہ** 5.5.1 Introduction, scope & application of Modified-release dosage forms 5.5.2 Common Terminologies used: Modified-Release (MR) Dosage Form, Extended-Release (ER) Dosage Form, Controlled Release (CR) Dosage Form, Prolonged Release (PR) Dosage Form, Sustained Or Slow Release (SR) Dosage Form and Long-Acting (LA) Dosage Form 5.5.3 Factors to be considered while formulating MR dosage forms • **M 5U 6 Paediatric & Geriatric dosage forms اشکال ادویہ برائے اطفال و مشائخ** 5.6.1 Introduction, Importance and Factors to be considered in formulating Paediatric & Geriatric dosage forms 5.6.2 Future trends & possibilities in Unani System of Medicine					
	M-6 Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms یونانی اور جدید اشکال ادویہ میں اساس، حامل مرکبات اور منظور شدہ غیر فعال اجزاء The module 'Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms' provides a comprehensive understanding of the non-pharmacological yet essential components used in drug formulations, focusing on their roles in Unani and conventional pharmaceutical preparations. It covers bases, vehicles, colorants,	1	5	10	15	30

	preservatives, sweeteners, surfactants, and emulsifying agents, detailing their significance, classification, and applications. • **M 6U 1 Bases and Vehicles اساس اور حامل مرکبات** 6.1.1 Definition and significance of bases and vehicles in preparation of drug dosage forms 6.1.2 Bases & Vehicles used in Unani and other Conventional dosage forms • **M 6U 2 Permitted Colorants & Flavoring Agents منظور شدہ اجزاء لونیہ اور اجزاء عطریہ** 6.2.1 Introduction and objectives of using Colorants & Flavouring Agents in drug dosage forms 6.2.2 Types of permitted Colorants & Flavouring Agents used in Unani and other Conventional dosage forms • **M 6U 3 Permitted Preservatives منظور شدہ محافظ ادویہ** 6.3.1 Definition and significance of Preservatives in drug dosage forms 6.3.2 Types of permitted Preservatives used in Unani and other Conventional dosage forms • **M 6U 4 Alternate Sweeteners متبادل اجزاء حلویہ** 6.4.1 Introduction and role of alternate/artificial sweeteners in preparation of drug dosage forms 6.4.2 Types of Alternate sweeteners used in Unani and other Conventional dosage forms • **M 6U 5 Surfactants and Emulsifying Agents عامل فعال سطحی عامل حلیب** 6.5.1 Definition of Surfactants and Emulsifying Agents and their significance in preparation of drug dosage forms					

	6.5.2 Types of Surfactants and Emulsifying Agents used in Unani and other Conventional dosage forms					
		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**
	M-7 Integration of technological advancements in Unani Pharmaceutical Sciences یونانی دواسازی میں تکنیکی پیش رفت کاانضمام This module explores the integration of modern technological advancements into Unani Pharmaceutical Sciences. It highlights emerging fields such as nanotechnology, bioinformatics, artificial intelligence, and computer applications, emphasizing their scope and applications in Unani Pharmaceutical Sciences. **• M 7U 1 Technological advancements in Unani Pharmaceutical Sciences علم الصیدلہ میں تکنیکی پیش رفت** 7.1.1 Introduction and scope of technological advancements in Unani Pharmaceutical Sciences	2	10	20	30	60

	• **M 7U 2 Nanotechnology in Unani Pharmaceutical Sciences علم الصیدلہ اور نینو ٹکنولوجی** 7.2.1 Definition and role of Nanotechnology in Pharmaceutics 7.2.2 Scope & Application of Nanotechnology in Unani Pharmaceutical Sciences • **M 7U 3 Bioinformatics in Unani Pharmaceutical Sciences علم الصیدلہ اور بائیوانفارمیٹکس** 7.3.1 Definition and role of Bioinformatics in Unani Pharmaceutical Sciences 7.3.2 Introduction of Major bioinformatics databases and resources: NCBI, GenBank, EMBL, and Expasy • **M 7U 4 Application of Computers in Unani Pharmaceutics یونانی دواسازی میں کمپیوٹرز کا اطلاق** 7.4.1 Need of computers in Unani Pharmaceutics 7.4.2 Application of Computers in various aspects/areas of Unani Pharmaceutics • **M 7U 5 Role of Artificial Intelligence (AI) in Unani Pharmaceutics علم الصیدلہ میں مصنوعی ذہانت کا کردار** 7.5.1 Potential role of Artificial Intelligence (AI) in Unani Pharmaceutics, its advantages and limitations					
	M-8 Packaging Material & Production Management in Unani Pharmaceutics (یونانی دواسازی میں پیکیجنگ میٹیریل اور تنظیم صنعت) The module 'Packaging Material Science & Production Management in Unani Pharmaceutics' provides a comprehensive understanding of the importance of packaging material and production management in Unani pharmaceutics. It covers the types of packaging, materials used, recent	2	10	20	30	60

	trends and advancements in pharmaceutical packaging. It also introduces learners to the significance of production management in pharmaceutical manufacturing and factors that affect production management. • **M 8U 1 Packaging Material پیکیجنگ میٹیریل** 8.1.1 Introduction & importance of Packaging Material • **M 8U 2 Types of Packaging پیکیجنگ کی اقسام** 8.2.1 Primary, Secondary & Tertiary packaging • **M 8U 3 Packaging materials used in pharmaceutics دواسازی میں مستعمل پیکیجنگ میٹیریل** 8.3.1 Different materials used for packaging-Glass, Plastics, Rubbers, Metal, Paper, Other materials 8.3.2 Factors affecting the selection of appropriate material • **M 8U 4 Pharmaceutical advancements in packaging دواؤں کی پیکیجنگ میں ہونے والی پیش رفت** 8.4.1 Scope of Pharmaceutical advancements in packaging 8.4.2 Recent trends and future of pharmaceutical packaging and packing materials • **M 8U 5 Production management تنظیم دواسازی** 8.5.1 Introduction & importance 8.5.2 Factors affecting production management 8.5.3 Pharmaceutical Manufacturing Facilities					
		4	20	40	60	120
		16	80	160	240	480

Paper No : 2 STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS						
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
	M-9 Quality Assurance, Standardisation and Good Practices in Unani Drugs **یونانی ادویہ کی ضمانت اوصاف، معیار بندی اور صنعت جیدہ** The module 'Quality Assurance, Standardisation and Good Practices in Unani Drugs' provides a proper understanding of quality control, quality assurance and standardisation and its aims and objectives in the Unani system of Medicine. The module also guides the importance of good practices to assure the quality, safety and efficacy of Unani medicines. It also covers the factors affecting the quality of drugs and adulteration in Unani Drugs. Additionally, it explores the overview of Monographs. • **M 9U 1 Quality Assurance, Quality Control and Standardisation ضمانت اوصاف، ضبط اوصاف اور معیار بندی** 9.1.1 Introduction to Quality Assurance, Quality Control and Standardisation 9.1.2 Factors Affecting the Quality of Unani Drugs 9.1.2.1 Extrinsic Factors	2	10	20	30	60

	9.1.2.2 Intrinsic Factors **• M 9U 2 Adulteration in Unani drugs یونانی ادویہ میں آمیزش** 9.2.1 Adulteration 9.2.1.1 Purpose of adulteration 9.2.1.2 Modes of adulteration 9.2.1.3 Types of adulteration 9.2.1.4 Deliberate adulteration 9.2.1.5 In-deliberate adulteration 9.2.2 Substitute of drugs their principle and ethics **• M 9U 3 Pre-requisites and primary steps for the quality, safety and efficacy of herbal medicines ادویہ کے معیاری، محفوظ اور مؤثر ہونے کے لئے درکار اقتضاء اساسی اور ابتدائی اقدامات** 9.3.1 Pre-requisites and primary steps for the quality, safety and efficacy of herbal medicines 9.3.1.1 Good Agriculture Practices (GAP) 9.3.1.2 Good Collection Practices (GCP) 9.3.1.3 Good Harvesting Practices (GHP) 9.3.1.4 Good Post-harvesting Practices (GPHP) 9.3.1.5 Good Storage Practices (GSP) 9.3.1.6 Good Laboratory Practices (GLP) 9.3.1.7 Good Manufacturing Practices (GMP) 9.3.1.8 Standard Operating Procedures (SOP) 9.3.2 Macroscopic characterization of crude material as per classical Unani literature and pharmacopoeia.					

	9.3.3 Botanical Reference Standards (BRS) **• M 9U 4 Aims and objectives of standardisation of Unani drugs یونانی ادویہ کی معیار بندی کے مقاصد اور اہداف** 9.4.1 Aims and objectives of standardisation of Unani drugs 9.4.1.1 Identification of botanical source 9.4.1.2 Identification of Adulterants 9.4.1.3 Identify the quality of crude drugs cultivated at different localities 9.4.1.4 Determination of suitable time of harvest 9.4.2 An Overview of parameters of drug standardisation and quality control 9.4.2.1 Identification 9.4.2.2 Purity 9.4.2.3 Quantitative analysis or assay **• M 9U 5 Overview of Pharmacopeial Monographs فارماکوپئیل مونوگراف کا جائزہ** 9.5.1 Overview of Monographs 9.5.1.1 Pharmacopeial Monographs of Unani Pharmacopoeia of India (UPI), Ayurvedic Pharmacopoeia of India (API), United States of Pharmacopoeia (USP), European Pharmacopoeia (Ph. Eur.), Indian Pharmacopoeia (IP) and British Pharmacopoeia (BP) 9.5.1.2 Monographs of World Health Organisation (WHO), European Scientific Cooperative on Phytotherapy ESCOP and Indian Council of Medical Research (ICMR)					
	M-10 Extraction of Herbal Drugs تعصیر ادویہ	2	10	20	30	60

	The module 'Extraction of Herbal Drugs' offers a comprehensive understanding of the importance of extraction in drug analysis in the Unani System of Medicine. It highlights the theory of drug extraction, factors affecting the choice of an extraction process, solvents used for extracting drugs and their properties and various methods of extraction. The module also guides learners to Advanced extraction techniques. • **M 10U 1 Introduction and importance of extraction in drug analysis ادویہ کے تجزیہ میں عمل تعصیر کا تعارف اور اہمیت** 10.1.1 Introduction and importance of extraction in drug analysis 10.1.1.1 Theory of drug extraction 10.1.1.2 Factors affecting the choice of an extraction process • **M 10U 2 Solvents used for extracting drugs and their properties عمل تعصیر میں مستعمل محللات اور ان کی خصوصیات** 10.2.1 Solvents used for extracting drugs and their properties • **M 10U 3 Methods of extraction عمل تعصیر کے طریقے** 10.3.1 Methods of extraction • **M 10U 4 Extraction of volatile and fixed oils روغن فراری اور روغن کثیف کشید کرنے کے طریقے** 10.4.1 Extraction of volatile and fixed oils • **M 10U 5 Determination of extractives in specific solvents مخصوص محللات میں مقدار تعصیر کا تعین** 10.5.1 Determination of extractives in specific solvents 10.5.1.1 Non-volatile Ether soluble Extractive 10.5.1.2 Volatile Ether soluble Extractive					

	10.5.1.3 Solvent Hexane soluble Extractives 10.5.2 Determination of extractable matter as per Unani Pharmacopoeia 10.5.2.1 Determination of Alcohol-soluble Extractive 10.5.2.2 Determination of Water soluble Extractives 10.5.2.3 Successive solvent extraction • **M 10U 6 Advanced extraction techniques عمل تعصیر کے جدید طریقے** 10.6.1Advanced extraction techniques 10.6.1.1 Supercritical fluid extraction 10.6.1.2 Microwave-assisted extraction 10.6.1.3 Ultrasound-assisted extraction					
		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
	M-11 Physico-chemical Evaluation of Unani Drugs-I یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ The module 'Physico-chemical Evaluation of Unani Drugs' describes the process of evaluating the quality and purity of Unani drugs (ASU) by means	2	10	20	30	60

	of various physico-chemical parameters and to understand the learners the development of physico chemical standards of Unani drugs to ensure the quality and check the adulteration. It highlights the methodology of all the important physico-chemical parameters which are important to develop the standards of the Unani Drugs. **• M 11U 1 Introduction of apparatus, Morphological Examination & Microscopical evaluation of Unani Drugs آلات کا تعارف، یونانی ادویہ کا نظری معائنہ اور خوردبینی تجزیہ** 11.1.1 Introduction of apparatus for Tests & Assays as per UPI 11.1.2 Morphological Examination 11.1.2.1 Organoleptic evaluation 11.1.3 Microscopical evaluation 11.1.3.1 Determination of stomatal number 11.1.3.2 Determination of Stomatal index 11.1.3.3 Determination of palisade ratio 11.1.4 Determination of vein islet number **• M 11U 2 Ash Value ایش ویلو** 11.2.1 Ash Value 11.2.1.1 Introduction 11.2.1.2 Total Ash 11.2.1.3 Determination of Total Ash 11.2.1.4 Acid Insoluble Ash 11.2.1.5 Determination of Acid Insoluble Ash 11.2.1.6 Water Soluble Ash					

	11.2.1.7 Determination of Water Soluble Ash 11.2.1.8 Sulphated Ash 11.2.1.9 Determination of Sulphated Ash **• M 11U 3 Moisture Content نمی کی مقدار** 11.3.1 Moisture Content 11.3.1.1 Introduction 11.3.1.2 Need of Determination of Moisture Content 11.3.1.3 Methods of Estimation of Moisture Content 11.3.1.4 Gravimetric Method 11.3.1.5 Water Loss on Drying or Vacuum Oven Method 11.3.1.6 Azeotropic Method 11.3.1.7 Toluene Distillation Method 11.3.1.8 Titrimetric/Chemical Method 11.3.1.9 Karl Fischer Method **• M 11U 4 Melting Point & pH نقطہ اذابت اور پی ایچ** 11.4.1 Melting Point 11.4.1.1 Introduction 11.4.1.2 Determination of Melting Point 11.4.1.3 Determination of Melting Range 11.4.2 pH Value/Introduction 11.4.2.1 Determination of pH values 11.4.2.2 Apparatus 11.4.2.3 Method					

	• **M 11U 5 Specific Gravity, Density & Solubility مخصوص ثقل اضافی، کثافت اور حل پذیری** 11.5.1 Specific Gravity & Density 11.5.1.1 Introduction 11.5.1.2 Methods used to determine the specific gravity 11.5.1.3 Liquids 11.5.1.4 Solids 11.5.2 Solubility 11.5.2.1 Introduction 11.5.2.2 Terms to Indicate Solubility 11.5.2.3 Classes of Solution 11.5.2.4 Factors Affecting the Rate of Solubility 11.5.2.5 Determination of the Solubility of a Solid					
	M-12 Physico-chemical Evaluation of Unani Drugs-II یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ The module 'Physico-chemical Evaluation of Unani Drugs' describes the process of evaluating the quality and purity of Unani drugs (ASU) by means of various physico-chemical parameters and to understand the learners the development of physico chemical standards of Unani drugs to ensure the quality and check the adulteration. It highlights the methodology of all the important physico-chemical parameters which are important to develop the standards of the Unani Drugs. • **M 12U 1 Viscosity لزوجت قوام** 12.1.1 Viscosity 12.1.1.1 Introduction	2	10	20	30	60

	12.1.1.2 Types of Flow 12.1.1.3 Factors influencing the Viscosity 12.1.1.4 Intrinsic Factor 12.1.1.5 Extrinsic Factor 12.1.1.6 Types and Units of Viscosity 12.1.1.7 Determination of Viscosity 12.1.1.8 Selection of Viscometer **• M 12U 2 Refractive Index & Optical Rotation انعطافی اشاریہ اور نوری گوش** 12.2.1 Determination of Refractive index 12.2.2 Optical Rotation 12.2.3 Determination of Specific Optical Rotation **• M 12U 3 Limit Tests as per UPI and Chemical tests for Phytoconstituents یو پی آئی کے مطابق حدود تفتیش اور نباتی اجزاء کے لیے کیمیاوی تفتیش** 12.3.1 Overview of Limit Tests as per UPI 12.3.2 Identification of Phytoconstituents/Assay of Metabolites 12.3.2.1 Alkaloids 12.3.2.2 Glycosides and Carbohydrates 12.3.2.3 Reducing and Non Reducing Sugars 12.3.2.4 Phytosterols 12.3.2.5 Proteins and Free Amino Acids 12.3.2.6 Flavanoids 12.3.2.7 Saponins 12.3.2.8 Phenols					

	12.3.2.9 Gums and mucilage 12.3.2.10 Resins 12.3.2.11 Tannins 12.3.2.12 Volatile Oil • **M 12U 4 Determination of Constants of Fats and Oils** شحوم وروغنیات کے معیار کا تعین 12.4.1 Determination of Constants of Fats and Oils 12.4.1.1 Saponification Value 12.4.1.2 Iodine Value 12.4.1.3 Acid Value 12.4.1.4 Peroxide Value 12.4.1.5 Unsaponifiable Matter 12.4.1.6 Determination Of Mineral Oil (Holde's Test) 12.4.1.7 Rancidity Test (Kreis Test) 12.4.1.8 Test For Archis Oil 12.4.1.9 Test For Cotton Seed Oil 12.4.1.10 Test For Sesame Oil 12.4.1.11 Test For Almond Oil					
		4	20	40	60	120
Semester No : 5						
2A Module Number	**2B Modules & units**	**2C Number of Credits**	**Notional Learning hours**			
			2D Lectures	**2E**	**2F**	**2G Total**

				Practical Training	Experiential Learning including Modular Assessment	
	M-13 Chromatographic Techniques کرومیٹوگرافک تکنیکس The module 'Chromatographic Techniques' provides insight into the principles, types, and instrumentation of various Chromatographic techniques. It highlights the role of chromatography in the analysis and quality control of Unani drugs. Additionally, it also gives an overview of Advanced Chromatographic Techniques used in drug analysis. **• M 13U 1 Introduction of Chromatography, Types, Principle, apparatus, instrumentation کرومیٹوگرافی کا تعارف، اقسام، اصول، آلات** 13.1.1 Introduction of Chromatography, Types, Principle, apparatus, instrumentation **• M 13U 2 Paper chromatography پیپر کرومیٹوگرافی** 13.2.1 Paper chromatography **• M 13U 3 Thin Layer chromatography تھن لیئر کرومیٹوگرافی** 13.3.1 Thin Layer chromatography **• M 13U 4 High Performance Thin Layer Chromatography ہائی پرفارمنس تھن لیئر کرومیٹوگرافی** 13.4.1 High Performance Thin Layer Chromatography **• M 13U 5 Column chromatography کالم کرومیٹوگرافی** 13.5.1 Column chromatography	2	10	20	30	60

	• **M 13U 6 High-Performance Liquid chromatography ہائی پرفارمنس لیکویڈ کرومیٹوگرافی** 13.6.1 High-Performance Liquid chromatography • **M 13U 7 Gas chromatography گیس کرومیٹوگرافی** 13.7.1 Gas chromatography • **M 13U 8 Ion exchange chromatography آئن ایکسچینج کرومیٹوگرافی** 13.8.1 Ion exchange chromatography • **M 13U 9 Advanced Chromatographic Techniques جدید کرومیٹوگرافک تکنیکس** 13.9.1 Overview of Advanced Chromatographic Techniques 13.9.1.1 Supercritical Fluid Chromatography (SFC) 13.9.1.2 Ultra-performance liquid chromatography (UPLC)					
	M-14 Spectroscopic Techniques اسپیکٹروسکوپک تکنیکس The module 'Spectroscopic Techniques' gives a basic understanding of the principles, instrumentation, applications, and significance of various spectroscopic techniques in analyzing and standardising Unani drugs. It also introduces the reader to advanced spectroscopic techniques like NMR, MS, FTIR, ICP-OES, ICP-MS. • **M 14U 1 Introduction of spectroscopy اسپیکٹروسکوپی کا تعارف** 14.1.1 Introduction of spectroscopy 14.1.2 Electromagnetic Radiation 14.1.3 Colorimetery: Principle and working 14.1.4 Beer-Lambert law • **M 14U 2 UV-Visible spectroscopy یو۔وی۔وزبل اسپیکٹروسکوپی**	2	10	20	30	60

	14.2.1 UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Applications of UV- Visible spectroscopy **• M 14U 3 Vibrational Spectroscopy وائبریشنل اسپیکٹروسکوپی** 14.3.1 Vibrational Spectroscopy 14.3.1.1 IR spectroscopy: Principle, Instrumentation and Applications 14.3.1.2 Raman Spectroscopy **• M 14U 4 Flame emission spectroscopy فلیم ایمیشن اسپیکٹروسکوپی** 14.4.1 Flame emission spectroscopy: Principle, Instrumentation and Applications **• M 14U 5 Atomic absorption spectroscopy اٹامک ابزارپشن اسپیکٹروسکوپی** 14.5.1 Atomic absorption spectroscopy: Principle, Instrumentation and Applications **• M 14U 6 NuclearMagnetic Resonance Spectroscopy نیوکلیئر میگنیٹک ریزونس اسپیکٹروسکوپی** 14.6.1 NuclearMagnetic Resonance Spectroscopy (NMR) **• M 14U 7 Mass Spectroscopy ماس اسپیکٹروسکوپی** 14.7.1 Mass Spectroscopy (MS) **• M 14U 8 FTIR, ICP-OES & ICP-MS ایف ٹی آئی آر، آئی سی پی۔او ای ایس اور آئی سی پی۔ایم ایس** 14.8.1 Brief description of the following 14.8.1.1 Fourier Transform Infrared Spectrometry (FTIR) 14.8.1.2 Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)					

	14.8.1.3 Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)					
		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
	M-15 Determination of contaminants in Unani drugs یونانی ادویہ میں آلودگیوں کا تعین The module 'Determination of contaminants in Unani drugs' gives detailed knowledge about various sources of contamination in Unani drugs and their health risks. It also encompasses the regulatory guidelines, safety evaluation, methods of detection of contaminants, and their pharmacopeial limits. **• M 15U 1 Microbial Contamination جرثومی آلودگیاں** 15.1.1 Microbial Contamination in Unani Drugs **• M 15U 2 Aflatoxins افلاٹوکسن** 15.2.1 Aflatoxins in Unani Drugs **• M 15U 3 Pesticide residue کرم کُش باقیات** 15.3.1 Pesticide residue in Unani Drugs	1	5	10	15	30

	• **M 15U 4 Heavy Metals ثقیل دھاتیں** 15.4.1 Heavy Metals-Contaminant in Unani Drugs • **M 15U 5 Radioactive contamination ریڈیواکٹیو آلودگی** 15.5.1 Radioactive contamination in Unani Drugs					
	M-16 Standardisation of compound drugs ادویہ مرکبہ کی معیاربندی The module 'Standardisation of compound drugs' provides an overview of the pharmacopoeial monographs of Unani Compound Drugs and gives an in-depth understanding of the Analytical Specifications of various Unani formulations. Furthermore, it communicates the comprehensive knowledge of specific analytical parameters of powders, Tablets, and Pills. • **M 16U 1 Overview of Monographs of Unani Compound Drugs mentioned in UPI Part -II یو پی آئی حصہ دوم میں درج یونانی مرکب ادویہ کے مونو گراف کا جائزہ** 16.1.1 Overview of Monographs of Unani Compound Drugs mentioned in UPI Part -II. Analytical Specifications of following compound drugs 16.1.1.1 'Araq 16.1.1.2 Sirka 16.1.1.3 Ravghan 16.1.1.4 Joshānda 16.1.1.5 Sharbat 16.1.1.6 Iṭrīfal 16.1.1.7 Ma'jūn 16.1.1.8 Khamīra 16.1.1.9 Marham/Ḍimād/Qayrūṭī	1	5	10	15	30

	16.1.1.10 Habb/Qurs 16.1.1.11 Safūf 16.1.1.12 Kushta **• M 16U 2 Specific Parameters of Solid Dosage Form Powder and Granules** **جامد اشکال ادویہ، سفوف اور دانہ دار سفوف کے مخصوص معیارات** 16.2.1 Specific Parameters of Powder and Granules 16.2.1.1 Properties for the characterisation of powder and granules 16.2.1.2 Factors affecting the Flow of Powders 16.2.1.3 Evaluation of Flow Properties **• M 16U 3 Tablets and Pills قرص وحب** 16.3.1 Specific Parameters of Tablets and Pills 16.3.1.1 Hardness 16.3.1.2 Factors Affecting the Hardness of Tablets 16.3.1.3 Friability 16.3.1.4 Disintegration 16.3.1.5 Weight Variation					
	M-17 Shelf-life & Stability Studies of Unani Drugs یونانی ادویہ کی مدت حیات اور استحکامی مطالعے The module 'Shelf-life & Stability Studies of Unani Drugs' provides an in-depth understanding of the shelf-life and stability studies of Unani drugs. It describes the detailed conditions of drying and storage of Unani drugs, and the classical Unani concept of shelf-life. The module also covers the regulatory guidelines, methods, and analytical techniques for stability testing of Unani Drugs.	1	5	10	15	30

	• **M 17U 1 Shelf-life & Stability Studies مدت حیات اور استحکامی مطالعے** 17.1.1 Shelf-life & Stability Studies of Unani Drugs 17.1.1.1 Condition for drying and storage of crude drugs 17.1.1.2 Storage conditions of finished Products 17.1.1.3 Shelf-life of Unani formulations as per D & C Act 17.1.1.4 Concept of Shelf-life/Ā ‘mār-i-Advia (Muddate hayāt) in Unani Literature • **M 17U 2 Stability Studies استحکامی مطالعے** 17.2.1 Stability Studies 17.2.1.1 Introduction of Kinetic drug decomposition and Order reactions 17.2.1.2 Types of Stability Study 17.2.1.2.1 Accelerated Stability 17.2.1.2.2 Long term Stability 17.2.1.2.3 Stress testing 17.2.1.3 Protocol for Stability testing • **M 17U 3 International Council for Harmonisation (ICH) انٹرنیشنل کاؤنسل فار ہارمونائیزیشن** 17.3.1 International Council for Harmonisation (ICH) guidelines for stability testing					
	M-18 Analytical/Quality testing laboratory as per Drugs Rules, 1945 ادویہ قوانین 1945 کے مطابق تجزیہ اوصاف کی تجربہ گاہ The module ‘Analytical/Quality testing laboratory as per Drugs Rules, 1945’ provides comprehensive knowledge of the regulatory framework and operational aspects of the In-house Quality control section under Schedule-T	1	5	10	15	30

	of the Drugs Rules, 1945. It also has a detailed description of the in-process and product quality control of Kushtajat. Furthermore, this module also edifies the reader about advanced analytical methods used for the analysis of Kushta. **• M 18U 1 Analytical/Quality testing laboratory تجزیہ اوصاف کی تجربہ گاہ** 18.1.1 Analytical/Quality testing laboratory as per Drugs Rules, 1945 18.1.1.1 In-house Quality control section under Schedule-T 18.1.1.2 Recommended Instruments & equipments 18.1.1.3 Chemistry section 18.1.1.4 Pharmacognosy section 18.1.1.5 Microbiology section **• M 18U 2 PART XVI (A) of Drugs Rules, 1945 ادویہ قوانین1945 کا حصہ XVI (A)** 18.2.1 PART XVI (A) of Drugs Rules, 1945 **• M 18U 3 Quality Control of Kushtajat کشتہ جات کا ضبط اوصاف** 18.3.1 Quality Control of Kushtajat as mentioned in Schedule-T 18.3.1.1 In-process Quality Control 18.3.1.2 Product Quality Control 18.3.2 Introduction of Advanced Analytical Methods for analysis of Kushta 18.3.2.1 XRD (X-ray diffraction) 18.3.2.2 AAS (Atomic absorption spectroscopy) 18.3.2.3 TEM (Transmission Electron Microscopy) 18.3.2.4 SEM (Scanning electron microscopy) 18.3.2.5 FTIR (Fourier Transform Infrared Spectroscopy)					

	18.3.2.6 TGA (Thermogravimetric analysis)					
		4	20	40	60	120
		16	80	160	240	480

Paper No : 3 EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY

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
	M-19 General Considerations in Experimental Pharmacology تجرباتی علم الادویہ کے عمومی نکات This module provides a comprehensive introduction to the foundational principles of experimental pharmacology. It begins by tracing the evolution of the field, establishing core concepts, and detailing the critical role of animal models in drug development. Students will gain practical knowledge regarding the selection, handling, and care of commonly used laboratory animals, including the understanding of their behavior and accurate sex determination. The curriculum progresses to cover precise dosage	2	10	20	30	60

	calculations, diverse drug administration routes, and appropriate blood collection techniques. Essential aspects of anesthesia and humane euthanasia are explored, alongside factors that influence drug responses in animal models. Finally, the module delves into the ethical framework governing animal experimentation, focusing on national and international guidelines. This includes a thorough examination of legal acts, supervisory committees, institutional responsibilities, and globally recognized standards, ensuring students grasp the importance of responsible animal use in research. **• M 19U 1 Basics of Experimental Pharmacology تجرباتی علم الادویہ کا اساسی علم** 19.1.1. The historical background, and development 19.1.2. Introduction 19.1.3. Drug Development and use of Animals 19.1.4. Commonly used experimental Animals 19.1.5. Animal Care, Handling and Sex Determination 19.1.6. Factors affecting drug responses in experimental animals **• M 19U 2 Dosing and Sampling of experimental animals تجرباتی حیوانات کو خوراک دینا اور نمونے جمع کرنا** 19.2.1. Dose calculation for experimental animals 19.2.2. Routes of drug administration in laboratory animals 19.2.3. Techniques of blood collection in laboratory animals 19.2.4. Anaesthetics used in experimental pharmacology 19.2.5. Euthanasia methods used in experimental pharmacology					

	• **M 19U 3 Ethical considerations for experimental animals تجرباتی حیوانات کے لیے اخلاقی پہلو** 19.3.1. Introduction to The Prevention of Cruelty to Animals Act, 1960 19.3.2. Introduction to Cruelity Helsinki declaration 19.3.3. OECD (Organisation for Economic Co-operation and Development) guidelines for experimental animals 19.3.4. The Committee for the Purpose of Control and Supervision of Experiments on Animals (CCSEA) and Institutional Animal Ethics Committee (IAEC) 19.3.5. ICMR Guidelines					
	M-20 General Introduction to Pharmacognosy علم وصف العقاقیر کا عمومی تعارف This module provides a foundational overview of pharmacognosy, emphasizing its historical development, particularly within the Unani system of medicine. Students will explore the classification of crude drugs, alongside principles of plant nomenclature and taxonomy. The curriculum transitions to applied aspects, addressing drug interactions, potential adverse effects, and the critical issue of adulteration in Unani drugs. The pharmacological activities of these drugs are examined, as are factors impacting their quality, and the commercial aspects of their production. Practical skills are developed through the study of medicinal plant identification, encompassing morphological, anatomical, and microscopical techniques, including quantitative microscopy and powder studies. Modern methods for phytochemical analysis and standardisation are also covered.	2	10	20	30	60

	Finally, the module delves into the taxonomical features of key plant families relevant to Unani medicine, providing a comprehensive understanding of their characteristics and medicinal significance. • **M 20U 1 Basics of Pharmacognosy علم وصف العقاقیر کا اساسی علم** 20.1.1. History, definition and scope of pharmacognosy 20.1.2. Historical development of pharmacognosy in Unani System of Medicine 20.1.3. Classification of crude drugs. • **M 20U 2 Applied Pharmacognosy عملی علم صف العقاقیر** 20.2.1. Introduction and importance 20.2.2. Adulteration and substitutes of Unani drugs 20.2.3. Factors affecting the quality of Unani drugs 20.2.4. Commerce and production of Unani crude drugs • **M 20U 3 Plant kingdom and nomenclature نباتات کی اقسام اور اسم بندی** 20.3.1. Plant kingdom and classification 20.3.2. Introduction, objectives, importance and application of taxonomy in pharmacognosy 20.3.3. Plant nomenclature: principles and importance • **M 20U 4 Taxonomical features of medicinally important families طبی نباتی خاندانوں کی درجہ بندی کی خصوصیات** 20.4.1. Apocynaceae, Asteraceae/Compositeae, Euphorbiaceae, Lamiaceae, Fabaceae (Leguminosae), Liliaceae, Malvaceae, Papaveraceae, Solanaecae, Umbellifercae.					

		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**
	M-21 Laboratory Animals used in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے تجرباتی جانور This module provides a comprehensive overview of laboratory animal experimentation. It covers the principles of experimental pharmacology, drug action, preclinical studies, and pharmacological experiment types. The module emphasizes ethical considerations, including the 3Rs principle, animal welfare, health, and stress management. It details the characteristics, handling, and pharmacological applications of rodent and non-rodent models, along with miscellaneous and invertebrate models, highlighting their uses in pharmacological studies. **• M 21U 1 Laboratory Animal Experimentation تجرباتی حیوانات پر مطالعے** 21.1.1. Principles and Fundamentals of Experimental Pharmacology	2	10	20	30	60

	21.1.2. Principles of drug action (Pharmacokinetics and Pharmacodynamics), Role of Preclinical studies in Drug development, and Types of Pharmacological Experiments (in vivo, in vitro, ex vivo) 21.1.3. The 3Rs principle (Replacement, Reduction, Refinement) 21.1.4. Animal Welfare: Animal housing and husbandry (environmental conditions, nutrition) 21.1.5. Animal health and disease management 21.1.6. Stress and pain management in laboratory animals • **M 21U 2 Rodent Models: Mice, Rats and Guinea pig, Hamster :روڈینٹ ماڈلز چوہے، مائس، گنی پگ، ہیمسٹر** 21.2.1. Rodents as Experimental animals 21.2.2. Common strains, biological characteristics, and behavior 21.2.3. Handling, restraint, and administration techniques 21.2.4. Applications in various pharmacological studies • **M 21U 3 Non-Rodent Models: Rabbits, Monkey, Dog, Cat :نان-روڈینٹ ماڈلز: خرگوش، بندر، کتا، بلی** 21.3.1. Non- Rodents as Experimental animals 21.3.2. Relevant physiological and anatomical features 21.3.3. Specific handling and experimental considerations 21.3.4. Applications in various pharmacological studies • **M 21U 4 Miscellaneous Models: Frog, Pigeon, Zebra fish, Chicken :دیگر ماڈلز مینڈک، کبوتر، زیبرا فش، مرغی** 21.4.1. Relevant physiological and anatomical features					

	21.4.2. Specific handling and experimental considerations 21.4.3. Applications in various pharmacological studies 21.4.4. Invertebrates used in experimental Pharmacology with minimal ethical consideration and its Applications in various pharmacological studies. Fruit flies (*Drosophila melanogaster*), Brine Shrimp (*Artemia salina*) and Nematodes (*Caenorhabditis elegans*)					
	M-22 Identification of crude drugs خام ادویہ کی شناخت This module provides a comprehensive approach to the identification of crude drugs. It begins with a detailed study of plant morphology and anatomy, covering various plant organs and tissues. The module then delves into cell differentiation and the significance of ergastic cell contents in plant identification. Practical skills are developed through instruction on microscopical techniques, including drug preparation and quantitative microscopy. Furthermore, it explores physico-chemical investigations, encompassing chemical tests for diverse phytoconstituents and physical evaluations. Advanced analytical methods are covered, featuring chromatographic and spectrophotometric techniques, essential for accurate drug identification. **• M 22U 1 Morphology and Anatomy of plants پودوں کی ساخت اور جسمانی بناوٹ** 22.1.1. Introduction, and importance morphology and anatomy in plant identification 22.1.2. Subterranean organs, Stems and Barks 22.1.3. Leaves or leaflets	2	10	20	30	60

	22.1.4. Inflorescences and Flowers 22.1.5. Fruits and seeds 22.1.6. Herbs 22.1.7. Unorganised drugs **• M 22U 2 Cell differentiation and ergastic cell content خلیوں کی تمیز اور ایر گاسٹک خلیاتی مواد** 22.2.1. Importance in plant identification 22.2.2. Cell wall, Parenchymatous tissues, Epidermis and Epidermal trichomes 22.2.3. Endodermis, Cork tissue, Collenchyma, Sclereids, and Fibres 22.2.4. Xylem and Phloem 22.2.5. Secretory Tissues 22.2.6. Ergastic Cell contents **• M 22U 3 Microscopical techniques for Identification of crude drugs خوردبینی تکنیکیں برائے شناختِ خام ادویہ** 22.3.1. Drug preparation for Microscopical examination and use of reagents 22.3.2. Identification of powdered drug: preliminary tests and microscopical examination 22.3.3. Quantitative Microscopy: Lycopodium spore method and Leaf examination **• M 22U 4 Physico-chemical investigations for identification of crude drugs خام ادویہ کی شناخت کے لیے طبعی و کیمیائی تجزیہ** 22.4.1. Chemical tests for the identification of therapeutically active phytoconstituents: Alkaloids, Glycosides, Cardiac glycosides,					

	Anthraquinone glycosides, Phenolic compounds, Flavonoids, Tannins, Saponins, Terpenoids, Steroids, Sugars, Carbohydrates, Fixed oils, and fats, Volatile oils, Saponins, Amino acids, Gums, and Mucilage. 22.4.2. Physical evaluation for the identification of crude drugs:Moisture content, Ash values (total, acid-insoluble, water-soluble, sulphated ash), Extractive values (water, alcohol, ether, chloroform), Solubility of drug in various solvents, Melting point, Boiling point, Specific gravity, Viscosity, Optical rotation, Refractive index, Fluorescence analysis, Fiber elasticity, Swelling factor, Foaming Index, Crude fibre content. 22.4.3. Chromatographic Techniques:Introduction and application of Chromatographic Techniques used in drug identification: Thin-Layer Chromatography (TLC), Column Chromatography, Paper Chromatography, High-Performance Liquid Chromatography (HPLC), High-Performance Thin Layer Chromatography (HPTLC), Gas Chromatography (GC), Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Ultra-High Performance Liquid Chromatography (UHPLC) 22.4.4. Spectrophotometric Methods:Introduction and application of Spectrophotometric methods used in drug identification: Ultraviolet-Visible (UV-Vis) Spectrophotometry, Infrared (IR) Spectrophotometry, Atomic Absorption Spectrophotometry (AAS), Atomic Emission Spectrophotometry (AES), Fluorescence Spectrophotometry					
		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
	M-23 In Vitro Experimental Studies and Alternative to Animal Experimentation ان وٹرو تجرباتی مطالعات اور حیوانات کے متبادل This module explores in vitro experimental techniques and ethical alternatives to animal testing. It covers good laboratory practices, biomedical waste disposal, tissue isolation, and muscle preparation, detailing specific tissue examples. The module examines apparatus like organ baths and force transducers used in these studies. It then shifts to ethical considerations, outlining the 5 Rs of animal ethics and the benefits/drawbacks of in vitro methods. Alternatives such as computational studies, microdosing, and physicochemical methods are discussed, offering a comprehensive view of modern experimental pharmacology. **• M 23U 1 Good Laboratory Practice (GLP) for Animal Experimentation (GLP) حیوانات پر تجربات کے لیے اعلیٰ تجرباتی مشق** 23.1.1. Introduction and Documentation in GLP 23.1.2. SOPs of GLP	2	10	20	30	60

	23.1.3. Need and importance of GLP 23.1.4. Terminologies used in experimental pharmacology and procedures 23.1.5. Duration of Animal Experimental studies 23.1.6. Biomedical Waste Management **• M 23U 2 Alternative to Animal Experimentation حیوانی تجربات کا متبادل** 23.2.1. The 5 Rs of Animal ethics and advantages and disadvantages of *In Vitro* studies 23.2.2. *In Silico* or Computational studies 23.2.3. Observational Studies 23.2.4. Microdosing 23.2.5. *In Vitro* studies 23.2.6. Physicochemical methods **• M 23U 3 Muscle Preparation عضلات کاری** 23.3.1. Fast and slow contracting smooth muscle preparation 23.3.2. Cardiac Muscle Preparation **• M 23U 4 Apparatus used for studying isolated tissue/ muscles تیار شدہ عضلات وانسجہ کے مطالعہ کے لیے استعمال ہونے والے آلات** 23.4.1. Organ Bath 23.4.2. Langendroff Apparatus 23.4.3. Wire Myographs 23.4.4. Force Transducers **• M 23U 5 Isolation of tissue/muscle عضلات وانسجہ کی تیاری** 23.5.1. Pharmacological importance and studies on isolated tissue/ muscle					

	23.5.2. Methods of isolation and preparation of tissue/ muscleChicken ileum, Guinea Pig Mysentric plexus, Rat Ascending and Descending colon, Rat Uterus, Rat Stomach Fundus, Frog Rectus Abdominis Muscle, Rabbit Duodenum, Rabbit Aortic Strip, Rabbit Perfused ear artery					
	M-24 Bioassay and Toxicity studies حیاتی تعین ومطالعہ سمیت The Bioassay and Toxicity Studies module covers the fundamental principles and applications of bioassays, including methodology, error analysis, and drug response relationships. It delves into the use of physiological salt solutions and the evaluation of antagonists. The module also explores commonly used instruments in experimental pharmacology, such as organ baths, kymographs, analgesiometers, and behavioural assessment tools. Finally, it examines the objectives and principles of toxicity studies, encompassing acute, subacute, and chronic assessments. **• M 24U 1 Bioassay حیاتی تعین** 24.1.1. Introduction and Principles of Bioassay 24.1.2. Application and Classification of bioassay 24.1.3. Methodology of Bioassay 24.1.4. Biological variation and methodological errors in Bioassay 24.1.5. Drug Response Relationship 24.1.6. Physiological salt solution, Dose Cycle and Response 24.1.7. Bioassay of Antagonists **• M 24U 2 Commonly used Instruments in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے عمومی آلات**	2	10	20	30	60

	24.2.1. Organ bath, Kymograph, Analgesiometers (Hot plate, tail flick), Plethysmometer, Actophotometer, Pole Climbing apparatus, Mazes • **M 24U 3 Toxicity studies مطالعہ سمیت** 24.3.1. Objective and Principles of Toxicity studies. 24.3.2. Acute, Subacute and Chronic Toxicity studies.					
		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**
	M-25 In-Vivo Animal Experimentation studies حیوانات پر کیے جانے والے تجرباتی مطالعات/جاندار نسیج This module explores in-vivo animal experimentation, covering anti-inflammatory, analgesic, and antipyretic studies, including carrageenan edema, hot plate, and yeast-induced pyrexia models. It delves into neuropharmacological studies, employing Irwin's profile, antidepressant, anti-anxiety, and anticonvulsant tests. Further, it examines nephrotoxicity and hepatoprotective studies, assessing drug-induced damage and	2	10	20	30	60

	protective effects through biochemical, histological, and functional analyses. Finally, it covers antidiabetic and hypolipidemic studies, evaluating drug effects on glucose and lipid levels using chemical induction, genetic models, and comprehensive assessment parameters • **M 25U 1 Antiinflammatory, Analgesic and Antipyretic Animal Experimentation studies** **دافع التہاب، دافع درد و دافع حمیٰ کے تجرباتی مطالعے** 25.1.1. Antiinflammatory studies: Carrageenan-induced paw edema test, Formalin test, Cotton Pellet Granuloma test, Adjuvant-induced arthritis test 25.1.2. Analgesic studies: Hot plate test, Tail flick test, Writhing test, Sciatic nerve ligation model 25.1.3. Antipyretic studies: Yeast-induced pyrexia model, Cytokine-induced pyrexia • **M 25U 2 Neurological Studies** **مطالعہ نظام عصبی** 25.2.1. Irwin's Profile 25.2.2. Antidepressant tests: Forced Swim Test, Tail Suspension Test, Sucrose Preference Test 25.2.3. Anti-anxiety tests: Elevated Plus Maze test, Open Field Test, Light-Dark Box test 25.2.4. Anticonvulsant tests: Maximal Electroshock Seizure Test, Pentylenetetrazole Induced Seizure Test, Kindling Models, Chemically induced seizures • **M 25U 3 Nephrotoxicity and Hepatoprotective studies** **گردوں کی سمیت اور تحفظ کبد سے متعلق مطالعے**					

	25.3.1. Nephrotoxicity studies: Drug-induced nephrotoxicity by cisplatin and gentamcin, Histological studies, Functional Assessments and Measurement of Oxidative stress markers 25.3.2. Hepatoprotective studies: Chemically Induced Hepatotoxicity by Carbon tetrachloride (CCl4), Paracetamol (acetaminophen), Thioacetamide (TAA) induced liver fibrosis, assessment of Biochemical Markers, Histopathological Examination **• M 25U 4 Antidiabetic and Hypolipidemic Studies دافع ذیابیطس اور تقصیر تدسم سے متعلق مطالعے** 25.4.1. Antidiabetic studies: Streptozotocin induced diabetes, Alloxan-induced diabetes, Assessment Parameters (Blood Glucose Levels, Insulin Levels, Lipid Profile, Histopathological examination of pancreatic beta-cells) Urine glucose and volume, Measurement of oxidative stress markers, Kidney function tests, Liver function tests. 25.4.2. Hypolipidemic Studies: High-Fat Diet-Induced Hyperlipidemia, Lipid Profile Analysis, Liver Function Tests, Histopathological Examination of tissues of the liver and arteries					
	M-26 Secondary metabolites of medicinal plants طبی نباتات کے ثانوی استحالاتی مرکبات This module explores the diverse world of plant-derived secondary metabolites, crucial for medicinal applications. It begins with compounds like alkaloids and glycosides, detailing their properties, extraction, classification, and therapeutic uses. It then shifts to lipids and volatile oils, covering their chemical characteristics, sources, and applications. The module examines gums and resins, outlining their properties and uses in traditional medicine.	2	10	20	30	60

	Finally, it delves into tannins and saponins, discussing their chemical structures, classifications, and therapeutic potentials. Throughout, the focus is on the properties, classification, and medicinal significance of these natural compounds. The module provides a comprehensive understanding of these vital plant constituents, highlighting their significance in traditional and modern medicine. • **M 26U 1 Alkaloids and Glycosides الکلائڈس اور گلائیکوسائیڈز** 26.1.1. Alkaloids: Introduction, Physical and Chemical Properties, Isolation and Extraction of Alkaloids, Classification of Alkaloids, Therapeutic uses, Role of Alkaloids in Plants occurrence and Distribution of Alkaloids 26.1.2. Alkaloid Containing Drugs - Classification and sourceIndole Alkaloids (*Strychnos nux-vomica, Rauvolfia serpentina, Catharanthus roseus, Claviceps purpurea*)Isoquinoline Alkaloids (*Berberis aristata, Papaver somniferum*)Tropane Alkaloids (*Datura stramonium, Atropa Belladona Hyoscyamus niger*)Quinoline Alkaloids (Cinchona- *Cinchona officinalis*)Amino Alkaloids (Colchicum autumnale, Ephedra- *Ephedra sinica*)Pyridine Alkaloids (*Areca catechu, Lobelia inflata*)Purine Alkaloids (*Coffea arabica, Camellia sinensis*)Imidazole Alkaloids (Pilocarpus- *Pilocarpus microphyllus*)Steroidal Alkaloids (*Withania somnifera, Holarrhena antidysenterica*)Diterpene Alkaloids (*Aconitum napellus*)Quinazoline Alkaloids (*Justicia adhatoda/ Adhatoda vasica* Nees)Miscellaneous alkaloids (*Eclipta alba, Phyllanthus niruri, Convolvulus pluricaulis*)					

	26.1.3. Glycosides: Physical and Chemical Properties, Isolation and Extraction of Glycosides, Classification of Glycosides, Role of Glycosides in Plants, Therapeutic uses Occurrence and Distribution of Glycosides containing drugs: 26.1.4. Glycoside Containing Drugs - Classification and source Anthracene Glycosides (*Aloe vera, Rheum rhabarbarum, Senna alexandrina/ Cassia angustifolia/ Cassia acutifolia*)Steroidal Glycosides (*Digitalis purpurea*, Scilla maritima/ *Urginea maritima*)Saponin Glycosides (*Bacopa monnieri, Tribulus terrestris, Asparagus racemosus, Glycyrrhiza glabra, Centella asiatica*)Cyanogenetic Glycosides (Prunus - *Prunus dulcis, Prunus avium*)Isothiocyanate Glycosides (Mustard seeds - *Brassica juncea*, *Brassica nigra*)Flavonoidal Glycosides (*Citrus limon*, *Citrus medica*)Coumarin and Furanocoumarine glycosides (*Ammi majos*, *Psoralea corylifolia*)Aldehyde Glycosides (*Hemidesmus indicus*, *Vanilla planifolia*)Phenol Glycosides (Arctostaphylos uva-ursi)Steroidal Glyco-Alkaloides (Solanum- *Solanum nigrum, Solanum aculeastrum, Solanum tuberosum*)Bitter Glycosides (Gentiana - *Swertia chirata, Gentiana lutea*)Miscellaneous Glycosides (*Gymnema sylvestre*, *Tinospora cordifolia, Lawsonia inermis, Andrographis paniculata, Picrorhiza kurroa, Stevia rebaudiana*) • **M 26U 2 Lipids and Volatile oils شحمیات اور روغن فراری**					

	26.2.1. Lipids (Fixed Oils, Fats and Waxes): Introduction, Chemical tests for identification of Fixed Oils or Fats, Classification of Fixed Oils, Therapeutic effects, Analytical Parameters for Oils and FatsWaxes and Uses 26.2.2. Fixed oils containing drugs and ClassificationClassification Based on Source:*Plant-Based Fixed Oils*Seed Oils (Sunflower oil, Sesame oil, Castor oil, Cottonseed oil)Fruit Oils (Olive oil, Coconut oil, Avocado oil)Nut Oils (Almond oil, Walnut oil)*Animal-Based Fixed Oils*Liver Oils (Cod liver oil)Other Animal Oils (Lard)Based on Fatty Acid CompositionSaturated Oils (Coconut oil, Palm oil, Animal fats)Unsaturated Oils (Monounsaturated Oils: Olive oil, Peanut oil)Polyunsaturated Oils (Sunflower oil, Corn oil, Soybean oil)Classification Based on ConsistencyLiquid Oils (Sunflower oil, Cottonseed oil)Semi-Solid Oils (Coconut oil, Palm oil)Solid Oils (Derived from animal fats - Tallow, Lard)Classification Based on UseEdible Oils (Olive oil, Sunflower oil, Soybean oil)Medicinal Oils (Castor oil, Neem oil, Linseed oil, Blackseed oil)Industrial Oils (Castor oil, Tung oil)Cosmetic Oils (Almond oil)Classification Based on Extraction Method*Cold-Pressed Oils* (Extra virgin olive oil, Sunflower oil)*Hot-Pressed Oils* (Groundnut oil)*Solvent Extracted Oils* (Soybean oil, Corn oil) 26.2.3. Volatile oils and TerpenoidsVolatile Oils:Introduction, Chemical tests for Volatile Oils, Analytical Parameters for Volatile Oils and Therapeutic actions.Terpenoids:Introduction, General Properties, Isolation of Terpenoids, Therapeutic actions.					

	26.2.4. Volatile oils containing drugs and Classification:Classification of Based on SourceFlower Oils (Rose oil, Jasmine oil, Lavender oil)Leaf Oils (Eucalyptus oil, Peppermint oil, Spearmint oil)Fruit Oils (Orange oil, Lemon oil)Seed Oils (Coriander oil, Caraway oil)Root Oils (Ginger oil, Asafoetida oil)Wood Oils (Sandalwood oil, Cedarwood oil, Agarwood Oil, Camphor Oil)Bark Oils (Cinnamon oil)Resin Oils (Myrrh oil)Classification Based on Chemical CompositionTerpene-Based Oils: Monoterpene Oils (Lemon oil, Orange oil), Sesquiterpene Oils (Sandalwood oil, Cedarwood oil), Diterpene Oils (Rosemary oil)Phenolic-Based Oils (Clove oil, Thyme oil)Aldehyde-Based Oils (Cinnamon oil, Citral oil- Lemongrass oil and Lemon oil)Ketone-Based Oils (Peppermint oil, Eucalyptus oil)Esters (Lavender oil, Sweet orange oil)Classification Based on Method of ExtractionSteam Distilled Oils (Peppermint oil, Eucalyptus oil, Lavender oil)Cold Pressed Oils (Lemon oil, Orange oil) Solvent Extracted Oils (Jasmine oil, Rose oil)Enfleurage (Jasmine absolute oil)CO2 Extraction (Rose oil, Lavender oil) 26.2.5. Terpenoid containing drugs and classificationMonoterpenoid containing Drugs (*Cinnamomum camphora*, *Carum carvi*, *Eucalyptus globulus*, *Foeniculum vulgare*, *Mentha piperita*, *Lavandula angustifolia*, *Citrus limon*, *Cymbopogon citratus*, *Ocimum tenuiflorum*, and *Myristica fragrans*)Drugs containing Sesquiterpenoids (*Acorus calamus*, *Artemisia absinthium*, *Syzygium aromaticum*, *Piper cubeba*, *Santalum album*, *Saussurea lappa*, and *Valeriana officinalis*)Drugs containing Diterpenoids (*Taxus baccata*)Drugs containing Triterpenoids (Ambergiris - *Physeter*					

	macrocephalus)Drugs containing Tetraterpenoids and Polyterpenoids (*Crocus sativus*) **• M 26U 3 Gums and Resins صمغیات وراتینج** 26.3.1. Gums: Introduction, Characteristics, Properties, therapeutic actions, and classification of Gums 26.3.2. Gums containing drugs:*Acacia senegal/ Acacia arabica*, *Astragalus gummifer, Boswellia serrata, Ferula assa-foetida*, *Pistacia lentiscus* 26.3.3. Resins Introduction, Properties, Tests for identification, Isolation of Resins, Therapeutic actions 26.3.4. Resins containing drugs and classification:Classification based on their type of constituents (Acid resins, Ester Resins, Resin alcohols)Classification based on their combination (Oleoresin, Oleo-gum resins, Glycoresins, Balsams, Ressenes)Drugs containing Resins (*Ferula assa-foetida*, *Boswellia serrata*, *Cannabis sativa*, *Capsicum annuum*, *Citrullus colocynthis*, *Curcuma longa*, *Ipomoea purga*, *Zingiber officinale*, *Commiphora wightii*, *Ipomoea purga*, *Commiphora myrrha*, *Myroxylon balsamum*, *Laccifer lacca*, and *Pinus roxburghii*) **• M 26U 4 Tannins and Saponins ٹینٹرزاورساپونز** 26.4.1. Tannins:Introduction, Properties, Therapeutic actions, and Isolation 26.4.2.Tannins containing drugs and Classification:1. Classification Based on Chemical Structure					

	26.4.2.1. Hydrolyzable Tannins: Glotannins: (Oak gall - frm the Quercus species), Ellagitannins: (Pomegranate tannin - *Punica granatum*, Raspberry tannin - *Rubus idaeus*) 26.4.2.1.1. Condensed Tannins: Proanthocyanidins (*Theobroma cacao*, *Vitis vinifera*, and *Pinus pinaster*)2. Classification Based on Solubility 26.4.2.2.1. Water-Soluble Tannins (Gallotannins, Ellagitannins, Oak gall tannins, Tea tannins) 26.4.2.2.2. Alcohol-Soluble Tannins (Pine bark tannins, Cocoa tannins)3. Classification Based on Behavior 26.4.2.3.1.True Tannins (Gallotannins: *Quercus infectoria, Rhus coriaria*), (Ellagitannins: *Punica granatum*, *Rubus* spp - Blackberries, *Rubus idaeus*) 26.4.2.3.2. Pseudotannins (Catechins - *Camellia sinensis*, Flavonoids - *Ginkgo biloba* (Ginkgo) and various *Citrus* species, *Vitis vinifera*).4. Classification Based on Occurrence 26.4.2.4.1. Vegetable Tannins (Plant Tannins): (Tea -*Camellia sinensis*, Galls - *Quercus species*, Sumac - *Rhus species*) 26.4.2.4.2. Animal Tannins (Honey - *Apis mellifera*, Galls - *Quercus infectoria*) 26.4.3. Saponins: Introduction, Properties, therapeutic actions, and Tests for Identification, Isolation Methods 26.4.4. Saponins containing drugs and Classification:1. Classification Based on Chemical Structure					

	26.4.4.1. Triterpenoid Saponins (Ginsenosides from *Panax ginseng*, Aescin from *Aesculus hippocastanum*, Quillaja saponins from *Quillaja Saponaria*, Soyasaponins from *Glycine max*) 26.4.4.1.1. Steroidal SaponinsDiosgenin from Dioscorea (wild yam).Solasonine and Solamargine from Solanum species (e.g., *Solanum dulcamara*).Sarsasapogenin from Sarsaparilla (Smilax species).2. Classification Based on Glycosidic Linkage 26.4.4.2.1 Monosaccharidic Saponins: Quillaja saponins 26.4.4.2.2 Disaccharidic Saponins: Ginseng 26.4.4.2.3 Oligosaccharidic Saponins: Soya saponins,3. Classification Based on Source 26.4.4.3.1. Leguminosae: (*Glycine max*, *Cicer arietinum*, Lupins) 26.4.4.3.2. Asteraceae: *Cichorium intybus*, Echinacea - *Echinacea purpurea*, *Echinacea angustifolia*. 26.4.4.3.3 Sapindaceae: *Quillaja saponaria*, *Sapindus mukorossi* 26.4.4.3.4 Dioscoreaceae: Wild yam - *Dioscorea villosa, Dioscorea floribunda* 26.4.4.4.1 Classification Based on Biological Activity5. Classification Based on the Presence of Specific Functional Groups 26.4.4.5.1 Oleanane-Type Saponins: Aescin. 26.4.4.5.2. Ursane-Type Saponins: Asiaticoside. 26.4.4.5.3. Dammarane-Type Saponins: Ginsenosides					
		4	20	40	60	120

		16	80	160	240	480
Paper No : 4 UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT						
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**
	M-27 Unani Cosmetology یونانی تزئینیات This module provides an overview of the historical development, classification, and scope of Unani cosmetology, highlighting its natural ingredients like herbs, minerals and natural ingredients. It also explores the excipients used in Unani cosmetics, both natural and artificial, that enhance product stability and efficacy. Additionally, the module covers Itriyat (Unani perfumery), including its history, key ingredients, and extraction methods, and concludes with a look at the process of developing cosmetic products, from raw materials to final formulation. **• M 27U 1 Introduction of Unani Cosmeceuticals یونانی تزئینیات کا تعارف** 27.1.1: The historical background, and development تاریخی پس منظر اور پیش رفت	2	10	20	30	60

	27.1.2: Introduction, classification, and scope of Unani cosmetology یونانی تزئینیات کا تعارف، درجہ بندی اور دائرہ کار 27.1.3: Ingredients used in the Unani cosmetology یونانی امور زینت میں استعمال ہونے والے اجزاء **• M 27U 2 Excipients used in Unani Cosmetics یونانی تزئینیات میں غیر فعال اجزاء کا استعمال** 27.2.1: Natural and Artificial excipients قدرتی اور مصنوعی غیر فعال اجزاء 27.2.2: Classification and application درجہ بندی اور اطلاق **• M 27U 3 'Itriyāt (Perfumery and fragrances) عطریات** 27.3.1: Introduction and history of 'Itriyāt(Perfumes) عطریات کا تعارف اور اس کا تاریخی پس منظر 27.3.2: Ingredients and Extraction methods of 'Itriyāt عطریات کے اجزاء اور کشید کرنے کے طریقہ **• M 27U 4 Product Development مصنوعات کے فروغ کے مراحل** 27.4.1: Raw materials, equipments and machinery used in Unani cosmetics یونانی تزئینیات کی ترکیب میں استعمال ہونے والے خام اجزاء، آلات اور مشین 27.4.2: Process of developing cosmetic products مصنوعات آرائش کی ترکیب اور فروغ کے مراحل					
	M-28 Production of Unani cosmetics یونانی صنعت تزئینیات The Production of Unani Cosmetics module explores the creation of cosmetic products based on Unani principles, using natural and therapeutic ingredients. It covers the formulation of skin care (face washes, serums, creams), hair care (shampoos, hair oils, Khizab), oral care (toothpaste, mouthwash, tooth powder), and color cosmetics (kajal, lipsticks, eye	2	10	20	30	60

	shadows). Learners will gain practical knowledge on how to blend traditional Unani ingredients with modern cosmetic technology to produce effective, holistic beauty and wellness products. **• M 28U 1 Formulation of skin care products جلد کی نگہداشت کیلیے مصنوعات کی تیاری** 28.1.1: Introduction and Classification تعارف اور درجہ بندی 28.1.2: Additives used in the Skin Care Formulations جلد کی نگھداشت کی مصنوعات میں اضافی اشیاء کا استعمال 28.1.3: Ghāza، Ghāliya، Ubtan، Ābiyāt, Ḍimād, Tilā', Adhān, Ghasūl, Marham, Ghamza, Nawra غازہ، غالیہ، ابٹن، آبیات، ضماد، ظلاء، ادھان، غسول، مرہم، غمزہ، نورہ 28.1.4: Face wash, Face serum, Cream, Body lotion, Scrub, Body oil, Sunscreen فیس واش، فیس سیرم، کریم، باڈی لوشن، اسکرب، باڈی آئل، سن اسکرین **• M 28U 2 Formulation of hair care products بالوں کی نگہداشت کیلیئے مصنوعات کی تیاری** 28.2.1: Shampoo, Medicated hair oils, Khiḍāb (Hair dyes) شیمپو، دھن طبی برائے شعر، خضاب **• M 28U 3 Formulation of oral care products دھن کی نگہداشت کیلیئے مصنوعات کی تیاری** 28.3.1: Toothpaste, Sanūn (tooth powder), Mouth wash, Ghargharah(Gargle), Oral gel, Mouth fresheners ٹوتھ پیسٹ، ٹوتھ پاوڈر، غرغرہ، اورل جیل، ماوتھ فریشنر **• M 28U 4 Formulations of colour cosmetic products متلون تزئینیاتی مصنوعات کی تیاری** 28.4.1: Kājal, Surma, Eye shadows, Lipsticks, Tints (Lip Tints and Cheek Tints) کاجل، سرمہ، آئی شیڈو، لپ اسٹک،، لپ ٹنٹس، چیک ٹنٹنٹس					
		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
	M-29 Regulatory Framework for Unani Drugs قوانین وضوابط برائے یونانی ادویہ This module provides a detailed understanding of the legal and regulatory provisions governing Unani drugs, focusing on the Drug and Cosmetic Act of 1940, the Drug Rules of 1945, and the Good Manufacturing Practices (GMP) essential for maintaining the integrity of these traditional medicines. The primary objective of this module is to familiarize students and professionals with the statutory requirements and regulatory norms that influence the production and commercialization of Unani medicines. It highlights the importance of compliance with legal mandates to ensure that Unani drugs meet the required safety standards while maintaining their traditional therapeutic values. The module also provides insights into the classification, licensing, and guidelines associated with Unani drugs and their manufacturing standards. **• M 29U 1 The Drug and Cosmetic Act-1940 1940–1940 ڈرگ اینڈ کاسمیٹکس ایکٹ** 29.1.1: Introduction تعارف	2	10	16	34	60

	29.1.2: Chapter I: Definitions of Unani Drugs Section 3(a), 3 (a) :باب اول یونانی ادویہ کی تعریف سیکشن Definition of Unani Patent or Proprietary Medicine under Section 3(h) 3(h): یونانی پیٹینٹ یا ملکیتی دوا کی تعریف سیکشن 29.1.3: Chapter IV A, Chapter V باب IV A , باب V 29.1.4: Schedule I: Authoritative books of Unani Medicine شیڈول I: یونانی طب کی مستند کتابیں **• M 29U 2 The Drug Rules, 1945 - 1945 ڈرگ رولس** 29.2.1: Part XVI and XVI-A to Part XIX (Relevant provisions of Unani Medicine under Rule 151-170)(170–151 ضوابط کے متعلقہ احکام۔ماتحت (یونانی طب XIX - پارٹ XVI و XVI-A، پارٹ A 29.2.2: Guidelines for Issue of Licences: لائسنس کا اجراء اور اس کے اصول Classical Unani Drugs, Classical Unani Drugs with changed dosage forms,Classical Unani Drugs with New Indication, Patent or Proprietary Unani Medicine, Unani Health Promoters, Unani Cosmetics, Medicinal Plant Extract، کلاسیکل یونانی دوائیں یونانی اشکال ادویہ میں تبدیلی یونانی دواوں کے نئے خواص پیٹنٹ یا ملکیتی یونانی دوائیں،، صحت کو فروغ دینے والی یونانی مصنوعاتیونانی تزئینیات، نبات سے حاصل شدہ عصارہ جات 29.2.3: Schedule E1: Poisonous substances of Unani Medicine شیڈول E-1: یونانی سمی مواد ادویہ **• M 29U 3 Good Manufacturing Practices(GMP) of Unani Drugs صنعت جیدہ برائے یونانی دواسازی** 29.3.1: Schedule T of Drugs Rules, 1945 T ڈرگس رولس 1945 شیڈول 29.3.2: Schedule TA of Drugs Rules, 1945TA ڈرگس رولس 1945 شیڈول					

	M-30 Other regulatory provisions in relation to Unani Drugs یونانی ادویہ کے حوالے سے دیگر قانونی ضوابط This module aims to provide a detailed understanding of the legal provisions applicable to Unani medicine. It delves into primary regulations such as the Drugs and Cosmetics Act, 1940, and the Drugs Rules, 1945, while also exploring supplementary regulations that impact the production, distribution, and sale of Unani drugs. These regulations are essential for practitioners, manufacturers, researchers, and regulatory professionals involved in the Unani pharmaceutical sector. By comprehensively covering these legal provisions, this module aims to equip learners with the necessary knowledge to navigate regulatory requirements effectively. **• M 30U 1 Introduction of other regulatory provisions in relation to Unani Drugs یونانی فارمیسی کے حوالے سے مخصوص قوانین کا تعارف** 30.1.1: The Drug and Magic Remedies (Objectionable Advertisements) Act, 1954 and Rules, 19551955 دواؤں اور جادوئی علاج (قابل اعتراض اشتہار کا قانون)، 1954 اور قواعد، 30.1.2: The Narcotic Drugs and Psychotropic Substances Act, 1985 [Only the matters related with medicinal Opium]1985 نشہ آور ادویات اور منتقلب نفسی مواد کا قانون، (صرف طبی افیون سے متعلقہ امور) 30.1.3: The Medicinal and Toilet Preparations (Excise Duties) Act, 1955 [Only the matters related with Unani drugs] طبی اور مصنوعات زینت و آرائش پر محصول (ایکسائز ڈیوٹیز) کا قانون، 1955 (صرف یونانی دواؤں سے متعلق امور)	2	10	20	30	60
		4	20	36	64	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
	M-31 Intellectual Property of Unani Drugs یونانی دوائیں اور حق دانشوری This module provides a comprehensive overview of the legal aspects governing Intellectual Property in Unani medicine, including different types of IPR and patent laws related to the industry. By covering these critical aspects, this module aims to equip learners with a comprehensive understanding of Intellectual Property Rights and patent laws relevant to Unani drugs. Mastering these concepts will enable professionals in the field to protect their innovations, enhance product value, and contribute to the sustainable growth of the Unani pharmaceutical industry. **• M 31U 1 Intellectual Property Rights [IPR]، حقوق ملکیت دانشوری** 31.1.1: Introduction تعارف 31.1.2: Types of Intellectual Property Rights: حق ملکیت دانشوری کی اقسام Trademarks, Copyrights, Trade secrets, industrial designs, geographical indications تجارتی نشان، حق نقل واشاعت، تجارتی راز، صنعتی ڈیزائنز، جغرافیائی نشانات	2	10	20	30	60

	• **M 31U 2 Patent Laws related to Unani drugs یونانی ادویہ سے متعلق اجازہ تحفظ کے قوانین** 31.2.1: The Patents Act, 1970 and its role in Intellectual Property Protection پیٹنٹس ایکٹ 1970 اور دانشورانہ ملکیت کے تحفظ میں اس کا کردار 31.2.2: The Process of Patent Filing and Registration پیٹنٹ کی درخواست اور رجسٹریشن کا عمل					
	M-32 Pharmacovigilance and use of Artificial Intelligence in Unani Pharmacy (فارماکو ویجلنس اور یونانی فارمیسی میں مصنوعی ذہانت کا استعمال) The module consists of Pharmacovigilance and Safety Monitoring of Unani Drugs, addressing regulatory frameworks and ADR monitoring. This also explores the Role of AI in Unani Pharmacy, focusing on its applications in drug production, marketing, and safety analysis. Integrating pharmacovigilance and AI will help Unani medicine achieve greater credibility, safety, and global acceptance in modern healthcare. • **M 32U 1 Pharmacovigilance and Safety Monitoring تاثیر ادویہ اور بحفاظت استعمال کی نگہبانی** 32.1.1: Adverse Drug Reactions (ADR) Monitoring for Unani Medicines یونانی دواؤں کے منفی ردعمل کی نگرانی 32.1.2: Regulations related to Pharmacovigilance in Unani System of Medicine یونانی طب میں تاثیر ادویہ کی نگرانی سے متعلق قواعد وضوابط • **M 32U 2 Role of Artificial Intelligence in Unani Pharmacy یونانی فارمیسی میں مصنوعی ذہانت کا کردار** 32.2.1: Role of Artificial Intelligence: Manufacturing, Marketing, Pharmacovigilance دواسازی، مارکیٹنگ اور تاثیر ادویہ کی نگرانی میں مصنوعی ذہانت کا کردار	2	10	20	30	60
		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
	M-33 Unani Pharmaceutical Management یونانی صنعت دواسازی کی تنظیم، This module focuses on the key principles of pharmaceutical management, emphasizing the importance of material management, procurement, inventory control, and quality assurance in Unani pharmacy. By integrating systematic approaches, this module aims to enhance the efficiency, safety, and standardisation of Unani pharmaceutical practices. Effective pharmaceutical management in Unani medicine involves meticulous handling of raw materials, packaging, storage, and distribution to maintain product integrity. Ensuring quality at every stage of production is vital for maintaining efficacy, safety, and regulatory compliance. This module equips learners with the necessary knowledge to optimize Unani pharmaceutical management and uphold the integrity of traditional medicine in modern healthcare. • **M 33U 1 Material Management مواد کا نظم**	2	10	20	30	60

	33.1.1: Procurement and Inventory management: Raw material, packaging material, and Finished goods خریداری اور انوینٹری مینجمنٹ: خام مال، پیکجنگ مواد، اور تیار شدہ مصنوعات • M 33U 2 Quality Management نظم اوصاف 33.2.1: Quality Control: Cultivation, Collection, Identification, Storage, Drying, Processing, In- process quality control, Finished products, Distribution زراعت و ذخیرہ اندوزی، شناخت، جمع آوری، تجفیف، اعمال دواسازی، ترکیب ادویہ کے مراحل اور ضبط اوصاف برائے تیار شدہ مصنوعات اور ان کی فراہمی					
	M-34 Commercialization and Marketing of Unani drugs یونانی دواوں کی تجارت اور خرید و فروخت) This module, "Commercialization and Marketing of Unani Drugs," explores the strategies and practices essential for bringing Unani medicines to a wider market. It delves into the specific challenges and opportunities within the pharmaceutical marketing of Unani products, considering both traditional and modern approaches. The course covers regulatory compliance, digital marketing, and effective distribution channels. Furthermore, it examines the critical aspects of advertising, promotion, and technology transfer. Finally, it addresses the entrepreneurial landscape for Unani pharmacy, focusing on startup opportunities and available government support. • M 34U 1 Pharmaceutical Marketing of Unani drugs یونانی ادویہ کی مارکیٹنگ 34.1.1: Introduction and scope of Pharmaceutical Marketing تسویق دواسازی کا تعارف اور دائرہ کار 34.1.2: International Regulatory Compliance for Unani products یونانی مصنوعات کیلئے بین الاقوامی ضوابط	2	10	20	30	60

	34.1.3: Digital Marketing and E-Commerce of Unani drugs یونانی ادویہ کی ڈیجیٹل مارکیٹنگ اور ای کامرس • **M 34U 2 Advertisement and commercialization اشتہار اور فروغ کے دیگر ذرائع** 34.2.1: Advertising and other forms of Promotion اشتہار اور فروغ تجارت کے دیگر ذرائع 34.2.2: Distribution Channels: Manufacturer, Wholesaler, Retailer, Hospital and Government agencies. فراہمی کے ذرائع: دواساز ہول سیلر، خوردہ فروش، ہسپتال اور حکومتی ادارے 34.2.3: Technology transfer of Unani products یونانی مصنوعات کی ٹیکنالوجی کی منتقلی • **M 34U 3 Pharmaceutical Entrepreneurship and Startups in Unani Medicine یونانی طب میں صنعت کار دواسازی و آغاز گری** 34.3.1: Entrepreneurial opportunities in Unani pharmacy یونانی فارمیسی میں صنعت کاری کے مواقع 34.3.2: Startups, Cottage industries and other Government schemes for Unani entrepreneurs آغاز گری، کاٹیج انڈسٹری اور حکومت کی دیگر اسکیمیں					
		4	20	40	60	120
		16	80	156	244	480
		64	320	636	964	1920

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

Paper No : 1(PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)

Semester No : 3

Module 1 : Principles and Application of Pharmaceutical Processing - I اعمال صیدلہ کے اصول اور اطلاق

Module Learning Objectives

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

1. Describe the fundamental concepts of pharmaceutical processing of Unani drugs, covering size reduction, size separation, mixing, homogenization, and drying along with their objectives, principles, and influencing factors.
2. Identify various pharmaceutical processing methods and equipment used in Unani medicine, such as mills, sieving techniques, mixers, homogenizers, and dryers and demonstrate their role in optimizing drug formulation and production.
3. Evaluate the impact of different processing techniques on the quality, stability, and efficacy of Unani medicines, ensuring compliance with pharmaceutical standards and best practices in drug manufacturing.

Unit 1 Size Reduction of Unani drugs یونانی ادویہ کی تقصیر اجزاء

1.1.1 Definition and objectives of size reduction

1.1.2 Factors affecting the size reduction

1.1.3 Mechanisms of size reduction- Cutting, Compression, Impact and Attrition

1.1.4 Equipment used for size reduction- Cutter Mill, Runner Mills, Hammer Mill, Pulveriser, Roller Mills, Ball Mill and Fluid Energy Mill

References: 237,238,241,242,243,244,245,246,261,262,276,278

3A Course	3B Learning Objective (At the end of the (lecture/practical training /experiential	3C	3D	3E	3F	3G

Outcome	learning) session, the students should be able to)	Notional learning Hours	Lecture/ Practical Training/ Experiential Learning	Domain / Sub Domain	Level (Does/Shows how/Knows how/Know)	Teaching Learning Methods
CO1,CO2,CO3	Describe the concept, objectives, and importance of size reduction in the preparation of Unani medicines.	3	Lecture	CC	Knows-how	L_VC,L&PPT,L&GD,L
CO1,CO2	Perform Cutting, grinding, milling and attrition, and use various equipment of size reduction	6	Practical1.1	PSY-GUD	Shows-how	D,PER,PL,PT,DIS
CO2	Assess the suitability of different size reduction equipment, such as Cutter Mill, Hammer Mill, and Ball Mill, for specific purpose	8	Experiential-Learning1.1	CE	Does	JC,W,D,FV,BS

Unit 2 Size Separation of Unani drugs حجم کے لحاظ سے یونانی ادویہ کے اجزاء کی تفریق

1.2.1 Introduction and application of size separation

1.2.2 Sieving and related equipment -pharmaceutical sieves, sieve shaker, sifter

1.2.3 Grading of powders

1.2.4 Other techniques of size separation like sedimentation, elutriation and cyclone methods

References: 237,238,241,242,243,244,245,246,261,262,276,279,280,281,282,283,284

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concept and significance of particle size and size separation in the processing of Unani drugs, along with its applications.	3	Lecture	CC	Knows-how	L_VC,L&GD,L&PPT,L

CO1,CO2,CO3	Demonstrate the use of different types of size separation techniques and equipment.	6	Practical1.2	PSY-GUD	Shows-how	PL,DIS,D,PAL,PT
CO1,CO2,CO3	Apply and Compare different size separation techniques, including sieving, sedimentation, elutriation, and cyclone methods, based on their principles and effectiveness in Unani drug preparation.	6	Experiential-Learning1.2	PSY-GUD	Does	DL,JC,D,TUT,PL

Unit 3 Mixing & Homogenization of different dosage forms of Unani Medicines مختلف یونانی اشکال ادویہ کی باہم آمیزش اور یکسانیت

1.3.1 Introduction, advantages and application of mixing & homogenization

1.3.2 Factors affecting mixing, Types of mixtures and Mechanisms of mixing, demixing, powder segregation and ordered mixing

1.3.3 Mixing of solids & related equipment-tumbling mixers, agitator mixers

1.3.4 Mixing of miscible liquids, immiscible liquids and suspensions & related equipment -impeller, propeller mixers, turbine mixers, continuous mixers

1.3.5 Mixing of semisolids & related equipment– sigma blade mixer, planetary mixer, colloid mill, triple roller mill

1.3.6 Homogenization & homogenizers

References: 237,238,241,242,243,244,245,246,261,262,276,285,286,287,288,289,290

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concepts, advantages, and applications of mixing and homogenization and study about different types of mixers, mixing and demixing, Powder segregation, Ordered mixing and further know about factors affecting mixing and homogenization during the preparation of Unani medicines.	2	Lecture	CC	Knows-how	L&PPT,L,L&GD,L_VC
CO1,CO2,CO3	Perform mixing, demixing, powder segregation and ordered mixing in different pharmaceutical preparations.	4	Practical1.3	CAP	Shows-how	PT,D,PAL,DIS,DL

CO1,CO2,CO3	Apply various mixing and homogenization equipment, including tumbling mixers, impeller mixers, sigma blade mixers, and homogenizers, to determine their suitability for different forms of Unani medicines.	6	Experiential-Learning1.3	CAP	Does	PrBL,PAL,DIS,JC,PER

Unit 4 Drying of Unani Medicines یونانی ادویہ کی تجفیف

1.4.1 Definition, theory & objectives of drying

1.4.2 Factors affecting pharmaceutical drying

1.4.3 Drying of crude and prepared Unani drugs

1.4.4 Drying of wet solids- methods & equipment

1.4.4.1Convective drying- Tray dryer, Tunnel dryer, fluidized bed dryer

1.4.4.2 Conductive drying- vacuum oven

1.4.4.3 Radiation drying- microwave dryer

1.4.5 Drying of solutions and suspensions- methods and equipment

1.4.5.1 Freeze-drying (lyophilization)- Lyophilizer

1.4.5.2 Spray drying- Spray dryer

References: 237,238,241,242,243,244,245,246,261,262,276,291,292,293,294,295,296,297,298,299

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the theory of drying, factors affecting pharmaceutical drying and related challenges. Further discuss different types of drying methods with instruments used for particular method.	2	Lecture	CC	Knows-how	L_VC,L&PPT,L&GD,L
CO1,CO2,CO3	Compare different drying methods and related equipment for crude and prepared Unani drugs; wet solids, solutions, and suspensions.	4	Practical1.4	PSY-GUD	Shows-how	SIM,PL,DL,PAL,D

CO1,CO2,CO3	Evaluate the different types of drying methods along with their equipment and solve challenges related to drying.	6	Experiential-Learning1.4	CC	Does	DL,D,PL,DIS,PAL

Practical Training Activity

Practical Training 1.1 Size Reduction of Unani drugs

(Total duration of activity: 6 hours)

Activity 1:

1. The teacher will demonstrate the various methods of size reduction to students based on different mechanisms so that the students understand the application of these methods. (2 hours)

2. Students will perform practical to study the effect of trituration on particle size reduction using mortar and pestle (manual size reduction). They will select known quantity of at least four drug samples of different physical nature and perform trituration to assess the time taken to powder these drugs completely. Students will be encouraged for GD and present their observations in class. (4 hours)

Practical Training 1.2 Size Separation of Unani drugs

(Total duration of Activity: 6 hours)

Activity 1:

1. The teacher will demonstrate the particle size distribution of a pharmaceutical powder using a set of standard sieves. (1 hour)

2. Students will take at least three samples of different grades of powders and weigh the sample accurately. (1 hour)

3. Then they will arrange the sieves in descending order of their mesh size and place the sample on the top sieve and mechanically shake the sieves for a fixed period. (1 hour)

4. After that, they will weigh the material retained on each sieve and calculate the percentage retained and cumulative percentage. This will help them to determine the average particle size and distribution. (3 hours)

OR

The same practical can be performed by using a sieve shaker. OR 1. Students will be asked to determine particle size by measuring the sedimentation rate. They will prepare a suspension of the sample in a suitable medium and allow it to settle in a graduated cylinder. (2 hours) 2. The sedimentation height will be recorded at fixed intervals. (2 hours) 3. The particle size will be calculated by applying Stoke's law. This will help them to determine the size and density of the particles. (2 hours)
Practical Training 1.3 Mixing & Homogenization of different forms of Unani Medicines
(Total duration of Activity: 4 hours) 1. Teacher will demonstrate mixing of any drug sample in a suitable solvent to exhibit the importance of proper mixing in the preparation of homogenous drug solutions. (1 hour) 2. Students will take a known quantity of suitable substance soluble in distilled water and dissolve it using manual stirrer, magnetic stirrer or shaker at different speeds. the time taken to dissolve completely is measured and uniformity of solution is tested. this will help them to evaluate the effect of stirring speed on rate and completeness of mixing. (3 hours) OR 2. To study the effect of particle size and mixing technique on homogeneity of a powder mixture. Student will mix powders using geometric dilution and homogeneity is analysed by sieving or using microscopy. This will help them to assess the uniformity of mixture and compare the effect of different mixing times and methods. (3 hours)
Practical Training 1.4 Drying of Unani Medicines
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate the mechanism of different methods used for drying of drugs. (1 hour)

2. Students will perform the practical on moisture content determination of a drug sample before and after drying. In this, a drug sample is taken and weighed (W1), dried in hot air oven at 105 degree celcius for 2 hours and weighed again (W2). Then moisture content will be calculated. This will help them in understanding the initial moisture content and the drying efficiency. (3 hours) OR 2. Students will perform practical for determination of loss on drying (LOD) to measure the amount of water and volatile matter lost from a drug upon drying. the sample will be weighed before and after drying under specific conditions using hot air oven. LOD will be calculated as a percentage of initial weight. At the end it is ensured that the drug meets pharmacopoeial standards for moisture content. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 1.1: Size Reduction of Unani drugs
(Total duration of activity: 8 hours) 1. Students will identify different drugs to explore the challenges of size reduction for different type of drugs. (1 hour) 2. They will select and arrange samples of drugs of different nature. (2 hour) 3. They will perform size reduction and assess which method of size reduction is best suited for a particular drug. (3 hour) 4. They will evaluate and discuss the role of different factors such as structure, nature, quantity, hardness and moisture content in particle size reduction. (2 hour) OR 1. Students will be given task individually or divided in groups and they will select samples of drugs of different nature. (2 hours) 2. Perform size reduction using different instruments/ equipment. (2 hours) 3. Compare and assess the time taken for size reduction and particle size distribution in each case. (4 hours)
Experiential-Learning Learning 1.2: Size Separation of Unani drugs
(Total duration of Activity: 6 hours) 1. Students will be given individual/ group task to select and arrange any five dry solid drugs and perform size reduction by any method. (3 hours)

2. The powder thus obtained will be sieved manually through different sieves or mechanically by using sieve shaker or sifter and powders of different grades will be separated. (3 hours) OR 1. Students will perform a group task to survey the market and collect samples of different formulations with varying particle sizes to explore the relationship between particle size and drug performance. (3hours) 2. They will study the dissolution rate and discuss to develop an understanding of how size separation affects drug formulation and absorption. (3 hours)
Experiential-Learning Learning 1.3: Mixing & Homogenization of different forms of Unani Medicines
(Total duration of Activity: 6 hours) 1. Students will be given individual/ group task to prepare a working model of any type of mixer and demonstrate the principle and working in the class. (6 hours) OR 1. Students will be asked to evaluate the effect of homogenization in wet granulation. Dry powder of suitable drug will be prepared along with suitable binder (e.g. acacia, starch). (2 hours) 2. They will prepare a wet mass of drug and binder, granulate and dry the mixture. (2 hours) 3. Then uniformity in particle size distribution will be checked. This will help them to understand the role of mixing and homogenization in granule formation. (2 hours)
Experiential-Learning Learning 1.4: Drying of Unani Medicines
(Total duration of Activity: 6 hours) 1. Students will work individually or in groups to evaluate how particle size affects the drying rate of a drug. Firstly, the drug will be divided into fine, medium and coarse particle sizes and dried under identical conditions. (3 hours) 2. The time taken to reach a constant weight will be measured. This will help them to optimize drug formulation for faster or more uniform drying. (3 hours) OR

1.Students will be given individual tasks to compare the efficiency of different drying techniques (e.g. shade drying, dessicator drying, oven drying, etc). In this, the same drug sample will be dried using different techniques. the moisture content, drying time and drug stability post drying will be measured. This will help the students to identify the most effective and least damaging drying method. (6 hours)	
Modular Assessment	
Assessment	**Hour**
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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Project work – (20 Marks) • Research & Content -10 Marks	4

• Presentation & Creativity -5 Marks • Viva Voce & Explanation - 5 Marks Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Module 2 : Principles and Application of Pharmaceutical Processing - II اصول دواسازی اوران کا طلاق

Module Learning Objectives

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

1. Describe the principles and applications of filtration, clarification, extraction, sterilization and heating processes used in Unani medicine, detailing their mechanisms, influencing factors, and industrial application.
2. Compare different methods used for filtration, clarification, extraction, sterilization and heating, evaluating conventional techniques alongside knowledge of advanced technologies such as centrifugation, supercritical fluid extraction, microwave-assisted and ultrasound-assisted extraction methods, and ultrasonication.
3. Assess the significance of these processes in pharmaceutical applications, examining various filtration techniques, extraction methods, sterilization phenomena, high-level disinfection techniques, and heating processes.

Unit 1 Clarification & Filtration of Unani drugs یونانی ادویہ پر عمل ترویق و تصفیہ

2.1.1 Definition & importance of filtration and clarification

2.1.2 Mechanism of filtration and clarification

2.1.3 Factors affecting the rate of filtration

2.1.4 Filter media and filter aid

2.1.5 Types of filtrations and industrial filtration equipment- Gravity filters, Vacuum filters, Pressure filters

2.1.6 Centrifugation & related equipment

2.1.6.1 Introduction, importance and principles of Centrifugation

2.1.6.2 Laboratory & Industrial centrifuges

References: 237,238,241,242,243,244,245,246,251,261,262,276

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the theory of Clarification, Filtration and Centrifugation.	3	Lecture	CC	Knows-how	L&GD,L_VC,L,L&PPT
CO1,CO2,CO3	Demonstrate different filtration equipment, filter media and centrifuges	6	Practical2.1	CAP	Shows-how	D,DL,D-M
CO1,CO2,CO3	Perform some methods using various equipment suitable for clarification, filtration and centrifugation.	8	Experiential-Learning2.1	PSY-GUD	Does	PER,JC,DL,PL,D

Unit 2 Extraction of Unani drugs یونانی ادویہ پر عمل تعصیر

2.2.1 Introduction, scope and applications of extraction

2.2.2 Types of extracts

2.2.3 Conventional Methods of extraction & related equipment

2.2.3.1 Mechanical extraction

2.2.3.2 Liquid-Solid extraction

2.2.3.3 Liquid-Liquid extraction

2.2.3.4 Volatile oil extraction

2.2.4 Advanced extraction methods- Supercritical fluid extraction, Microwave-assisted extraction, Ultrasound-assisted extraction

References: 237,238,241,242,243,244,245,246,261,262,276,300,301,302,303,304,305,306,307

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the scope and applications of extraction. It also includes types of extracts, different methods of extraction & related equipment.	3	Lecture	CC	Knows-how	L_VC,L,L&GD,L&PPT
CO1,CO2,CO3	Demonstrate different methods of extraction.	6	Practical2.2	CAP	Shows-how	DL,PER,DIS,SIM,D
CO1,CO2,CO3	Perform different methods of extraction like Percolation, Soxhlation and Volatile oil extraction methods.	8	Experiential-Learning2.2	PSY-GUD	Does	SIM,PER,PT,FV,D

Unit 3 Sterilization تطہیر

2.3.1 Introduction, importance and applications of sterilization

2.3.2 Methods of sterilization - Heat sterilization, Gaseous sterilization, Radiation sterilization, Filtration sterilization, High-level disinfection

2.3.3 New/advanced methods of sterilization- Ultrasonication, Ultra-high Pressure sterilization

References:

237,238,241,242,243,244,245,246,261,262,276,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the scope and applications of sterilization and disinfection. It also includes different types of sterilization and disinfection methods.	2	Lecture	CC	Knows-how	L,L&PPT,L_VC,L&GD
CO1,CO2,CO3	Adapt different methods of sterilization and disinfection.	4	Practical2.3	CAP	Shows-how	PAL,PER,DL,D,SIM

CO1,CO2,CO3	Apply different methods of sterilization and disinfection.	5	Experiential-Learning2.3	CE	Does	PL,TPW,D-M,PER,JC
Unit 4 Heating Processes حرارت کاری 2.4.1 Definition, objectives and applications of heating 2.4.2 Methods of heat transfer – conduction, convection & radiation 2.4.3 Different heat processes & related equipment- Evaporation, Sublimation, Distillation, Crystallization, Burning/Incineration and Calcination **References:** 237,238,239,240,241,242,243,244,245,246,261,262,276,334,335,336,337,338,339						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO1,CO2,CO3	Describe heat, temperature and heat transfer including methods of heat transfer and different heat processes.	2	Lecture	CC	Knows-how	L&GD,L&PPT,L_VC,L
CO1,CO2,CO3	Demonstrate/ perform Crystallization, Evaporation, Sublimation, Distillation and Burning/Incineration along with use of pyrometer, muffle furnace.	4	Practical2.4	CAP	Shows-how	PAL,PL,DL,DIS,PT
CO1,CO2,CO3	Analyze Crystallization, Evaporation, Sublimation, Distillation and Burning/Incineration and operate related equipment.	5	Experiential-Learning2.4	CAN	Does	DL,PrBL,PER,D,TPW
Practical Training Activity						
Practical Training 2.1 Clarification & Filtration of Unani drugs						
(Total duration of Activity: 6 hours) 1. The teacher will demonstrate different types of funnels, filter equipment and filter media. (2 hours)						

2. Students will perform a practical to separate solid impurities from a liquid using gravity filtration. Any suspension can be prepared and other materials like filter paper, funnel and conical flask will be arranged. Firstly, filter paper is folded and placed in the funnel. Suspension is poured into the funnel, the filtrate is collected, and the clarity is observed. This will help students to understand the basic principle of gravity filtration and the role of filter paper pore size. (4 hours)
Practical Training 2.2 Extraction of Unani drugs
(Total duration of Activity: 6 hours) 1. The teacher will demonstrate the different methods of extraction such as maceration, percolation, soxhlation and oil extraction. (1-2 hours) 2. Students will perform practical on extraction of essential oils using Steam Distillation. The objective will be to isolate essential oils from Unani herbal drugs like *podina, darchini, elaichi* or *post-e-narangi*. Use steam distillation or Clevenger apparatus to separate volatile oils. Characterization of the collected oil can be done. (4-5 hours) OR 2. Soxhlet Extraction of any Unani drug. The objective is to extract pharmaceutically active ingredients from any suitable drug e.g. *Aslus Soos*. Use water as a solvent in a Soxhlet extractor. Evaporate the solvent from the extract by using water bath. Qualitative or quantitative analysis of the extract can be done. (4-5 hours) OR 2. Cold Maceration of Active Ingredients from Unani Medicinal Plants- The objective is to extract bioactive compounds from herbs like *Asgandh* or *Rehan*. Use water, ethanol or methanol as a solvent. Allow the mixture to stand for 24–48 hours with occasional stirring. Filter and concentrate the extract. Further, phytochemical properties of the extract can also be tested. (4-5 hours working)
Practical Training 2.3 Sterilization
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate the different methods used for sterilization. (1 hour) 2. Sterilization of Glassware by Dry Heat: The students will perform a practical to sterilize glassware using dry heat sterilization. They will use a hot air oven to sterilize glass containers, like test tubes and flasks. Preheat the oven to 160-180^{o}C and place the clean, dry glassware inside. Keep the glassware in the oven for

at least 30 minutes to ensure sterilization. After sterilization, the glassware is allowed to cool before using it in experiments or pharmaceutical preparation. (3 hours)

Practical Training 2.4 Heating Processes

(Total duration of Activity: 4 hours)

1. The teacher will demonstrate different heat processes such as Crystallization, Evaporation, Sublimation, Distillation, Burning/Incineration, and calcination to the students through different methods. (1 hour)

2. Student will perform practical on 'Evaporation of Solvents in Drug Formulations'. The objective will be to demonstrate the process of solvent evaporation during the preparation of certain dosage forms, such as solutions or suspensions. They will prepare a solution or suspension by dissolving the powdered crude drug or an active pharmaceutical ingredient (API) in a suitable solvent (e.g., ethanol or water). Heat the solution in a rotary evaporator (or using a simple water bath if a rotary evaporator is not available) to remove excess solvent. Gradually reduce the volume of the solution while maintaining a controlled temperature (usually below 60°C for organic solvents). The final volume of the concentrated solution will be measured and assessed for its consistency. Students will discuss how solvent evaporation is used in the preparation of concentrated formulations or in removing residual solvents from final products. This will help them to understand the importance of controlled heating in removing solvents and concentrating drug formulations without compromising the stability of drug or API. (3 hours)

OR

2. Students will perform 'Heat-Assisted Crystallization of Drug Compounds'. The objective is to demonstrate how heat can assist in crystallizing a drug or active pharmaceutical ingredients (APIs). Dissolve the selected drug (eg. *Kibreet*) or an API in a solvent at an elevated temperature to form a saturated solution. Slowly cool the solution to allow crystallization to occur. Observe the crystallization process and filter the crystallized product. Dry the crystallized material and weigh the yield. Discuss the factors influencing crystallization and the significance of crystal form in drug formulations (e.g., solubility, stability, and bioavailability). This will help them in understanding how heat can influence the crystallization of pharmaceutical compounds and the importance of controlling heating and cooling rates during crystallization. (3 hours)

OR

2. Any practical related to *Amal-e-Taseed* (sublimation), *Amal-e-Tareeq* (Distillation), *Amal-e-Ehraq* (Burning) or *Amal-e-Taklees* (Calcination) under the supervision of respective teachers. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 2.1: Clarification & Filtration of Unani drugs
(Total duration of Activity: 8 hours) **1. Role-Playing of Troubleshooting Filtration Issues in Manufacturing-** The objective is to develop critical thinking and teamwork in solving practical filtration problems. Present a scenario where filtration is failing in a drug production line (e.g., clogging, poor yield). Divide students into teams (e.g., production, quality control, R&D). Ask them to propose solutions based on process variables (pressure, filter material, particle size). This will help them in enhancing decision-making and teamwork skills in pharmaceutical production. (8 hours) OR **1. Build a DIY Filtration System-** The objective is to explore the design and function of filtration systems using simple materials. Students will arrange materials like sand, charcoal, cloth, and plastic bottles. Ask them to build a multi-layer filtration system and test it using a suspension and measure the clarity of the output. This will help them in understanding the principles of multi-stage filtration and material selection. (8 hours) OR **1. Model-** Prepare a model of *Jar-e-Alaqi* depicting the clarification process. (8 hours)
Experiential-Learning Learning 2.2: Extraction of Unani drugs
(Total duration of Activity: 8 hours) **1. Project-Based Learning-** Students will be asked to develop a Unani Formulation based on extract. The objective will be to extract and formulate a Unani product. Suitable ingredient(s) will be selected and extraction will be performed using maceration or Soxhlet extraction. A suitable dosage form will be developed using the extract and evaluated for its organoleptic, some physico-chemical parameters and stability. This will help them to formulate and characterize a formulation, including extraction efficiency. (8 hours)

OR

1. Comparative Study of Extraction Yields- Students will be asked to compare different extraction techniques for the same plant material. They will perform extraction using Maceration, Percolation, Soxhlation or any other method and measure the yield and perform some chemical tests for qualitative estimation of constituents. This will help them to analyse which method is most efficient for that particular drug and strengthen their skill of qualitative estimation. (8 hours)

OR

1. Students may be given a group task work for preparing a project/ model on different methods of extraction. (8 hours)

OR

1. Students may visit any laboratory/ department/ institute having advanced extraction facilities. (8 hours)

Experiential-Learning Learning 2.3: Sterilization

(Total duration of Activity: 5 hours)

1. Sterilization Experiment: Students will perform sterilization activity. Students can be provided with a selection of sterilization methods (e.g., autoclaving, dry heat, filtration, chemical sterilization). They will Set up a small-scale experiment for each sterilization method where students will sterilize a specific item or solution. Additionally, after completing the sterilization process, students can test the sterility of their samples by incubating them and observing for any microbial growth. Use of biological indicators (e.g., *Bacillus stearothermophilus* spores) and/or chemical indicators (e.g., autoclave tape) to monitor the success of the sterilization process can also be done. GD can be promoted to discuss the outcomes of the validation experiment and what each sterilization method was able to achieve. (5 hours)

OR

1. Infection Control and Sterilization Assessment: Students will be asked to assess and reinforce knowledge of infection control and sterilization procedures. In a hospital or pharmacy setting, students can carry out an infection control audit, inspecting areas where sterilization plays a key role (e.g., cleanrooms, pharmacy compounding areas). Students will assess the cleaning, disinfection, and sterilization procedures used and provide feedback on improvements. This could include checking sterilization equipment functionality, reviewing sterility test results, and identifying potential areas for improvement in infection control measures. (5 hours)

OR

1. Students may be given individual topics for PowerPoint/ Journal Club presentation. (5 hours)

OR

1. Students may be given a group task work for preparing a project/ model on any method of sterilization. (5 hours)

Note: By engaging in these experiential learning activities, students will deepen their understanding of sterilization in pharmacy and its critical role in ensuring the safety and effectiveness of pharmaceutical products. These activities will provide hands-on experience and practical knowledge that will be directly applicable in their future pharmacy practice.

Experiential-Learning Learning 2.4: Heating Processes

(Total duration of Activity: 5 hours)

1. Students will be given individual or group task to select any one heat process and practically demonstrate the whole process to the class. (5 hours)

OR

1. Students may be given individual topics for PowerPoint/ Journal Club presentation. (5 hours)

OR

1. Students may be given a group task work for preparing a project/ model on any type of heat process. (5 hours)Note: Overall, Field visit to a Pharmaceutical Manufacturing Unit can be planned. It will provide students with real-world exposure to different processing techniques used in pharmaceutical production. Arrange a visit to a pharmaceutical manufacturing facility where students will observe how industrial-scale processes are employed to prepare pharmaceuticals and ensure their quality. After the tour, students can participate in an interactive session where they ask questions and discuss the challenges in performing these processes from laboratory to industrial scale. Students will gain insights into the complexities of using these processes in a pharmaceutical production environment., including their efficiency, control, and safety measures.

Modular Assessment

Assessment	**Hour**

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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Project work – (20 Marks) • Research & Content -10 Marks • Presentation & Creativity -5 Marks • Viva Voce & Explanation - 5 Marks Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Semester No : 4

Module 3 : Formulation of Unani Pharmaceutical Dosage Form یونانی اشکال ادویہ کی ترکیب

Module Learning Objectives

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

1. Classify pharmaceutical disperse systems, explaining their principles, significance, and key components such as surface-active agents, gels, suspensions, emulsions, and foams.
2. Analyze the fundamentals of pharmaceutical rheology, including viscosity, fluid flow behavior, Newtonian and non-Newtonian fluids, and their impact on formulation stability and performance.
3. Assess key factors in bioavailability, and pharmaceutical preformulation, emphasizing their role in drug absorption, dosage form optimization, and compatibility studies.

Unit 1 Introduction to formulation of dosage form اشکال ادویہ کی ترکیب کا تعارف

3.1.1 Definition and importance of dosage form designing

3.1.2 Classification of Unani dosage forms

3.1.3 Factors affecting dosage form designing

References: 237,238,239,240,241,242,243,246,247,248,249,250,256

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concept, significance, and classification of Unani dosage forms in pharmaceutics	2	Lecture	CC	Knows-how	L&PPT,L,L_VC,L&GD
CO1,CO2,CO3	Identify and categorize different Unani dosage forms based on their physical state, composition and therapeutic applications۔	4	Practical3.1	CAP	Shows-how	SIM,PT,DL,PER,D

CO1,CO2,CO3	Analyze various factors affecting dosage form designing and assess their role in optimizing the stability, efficacy, and patient compliance of Unani medicines.	5	Experiential-Learning3.1	PSY-GUD	Does	PER,DL,D,TPW,JC

Unit 2 Disperse systems نظامِ امتداد

3.2.1 Definition and significance of pharmaceutical disperse systems

3.2.2 Classification of disperse systems- Molecular, Colloidal & Coarse dispersion

3.2.3 Surface-active agents

3.2.4 Gel, Suspension, Emulsion & Foams

References: 239,241,242,243,246,247,248,249,250,261,276,277,340,341,342,343,344,345,346,347,348,349,350,351,352

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the definition, significance, and classification of pharmaceutical disperse systems, including molecular, colloidal, and coarse dispersions.	3	Lecture	CC	Knows-how	L_VC,L,L&PPT,L&GD
CO1,CO2,CO3	Demonstrate the role of surface-active agents in stabilizing disperse systems and prepare formulations such as gels, suspensions, emulsions, and foams.	6	Practical3.2	CAP	Shows-how	DIS,PAL,D,PL,PT
CO1,CO2,CO3	Analyze the characteristics of different disperse systems and evaluate their applications in Unani medicine for enhancing drug stability and bioavailability.	9	Experiential-Learning3.2	CAN	Does	TPW,PL,PER,JC,DL

Unit 3 Rheology مطالعۂ سیالیات ولزوجیت

3.3.1 Introduction of viscosity, rheology and the flow of fluids

3.3.2 Newtonian & non-Newtonian fluids

3.3.3 Applications of rheology in pharmaceutical formulation

References: 242,243,244,245,246,247,248,249,250,353,354,355

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Discuss the concepts of viscosity, rheology, and fluid flow, difference between Newtonian and non-Newtonian fluids	2	Lecture	CC	Knows-how	L&GD,L_VC,L&PPT
CO1,CO2,CO3	Measure and compare the viscosity of different pharmaceutical fluids using rheological techniques and interpret their flow behavior	4	Practical3.3	CAP	Shows-how	PL,PER,W,PAL,Mnt
CO1,CO2,CO3	Analyze the role of rheology in pharmaceutical formulation and evaluate its impact on the stability, texture, and effectiveness of Unani medicines	5	Experiential-Learning3.3	CE	Does	BS,PL,PAL,DIS

Unit 4 Bioavailability حیاتی اثر پذیری

3.4.1 Introduction, concept and application

3.4.2 Physicochemical factors influencing bioavailability

3.4.3 Dosage form factors influencing bioavailability

References: 242,243,244,245,246,247,248,249,250,256,356,357,358,359,360,361,362

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concept of Bioavailability and factors influencing bioavailability	1	Lecture	CC	Knows-how	L&GD,L_VC,L&PPT ,L
CO1,CO2,CO3	Identify and analyze the impact of physicochemical and dosage form factors on the bioavailability of Unani medicines through case studies.	2	Practical3.4	CAP	Shows-how	PL,PAL,D,DIS,PER
CO1,CO2,CO3	Appraise the different factors influencing bioavailability	3	Experiential-Learning3.4	AFT-SET	Does	PER,PAL,PL,JC,LS

Unit 5 Pharmaceutical preformulation دواسازی کے اعمال ماقبل ترکیب

3.5.1 Introduction and importance of pharmaceutical preformulation

3.5.2 Assay development

3.5.3 Drug incompatibility

3.5.4 Different factors to be considered during preformulation– Solubility, Partitioning, Dissolution rate, Salt selection, Hygroscopicity, Physical form, Powder properties

References: 242,243,244,245,246,247,248,249,250,252,256,363,364,365,366,367,368,369

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concept, significance, and key aspects of pharmaceutical preformulation in Unani medicine development.	2	Lecture	CC	Knows-how	L,L_VC,L&PPT,L&GD
CO1,CO2,CO3	Perform basic preformulation studies, including assay development and drug compatibility testing, to assess the suitability of Unani formulations	4	Practical3.5	CAP	Shows-how	DIS,PL,DL,D,PAL
CO1,CO2,CO3	Analyze and evaluate different factors to be considered during preformulation	4	Experiential-Learning3.5	CE	Does	JC,PL,W,PER,DIS

Practical Training Activity

Practical Training 3.1 Dosage form designing

(Total duration of Activity: 4 hours)

1. The teacher will demonstrate the preparation methods of different categories of Unani dosage forms (e.g. solid, liquid and semi solid preparations). (1 hour)

2. Students will perform group tasks in identifying at least one dosage form from each category and prepare these formulations as described in Formulary or Pharmacopoeia. (3 hours)

Practical Training 3.2 Disperse systems
(Total duration of Activity: 6 hours) 1. The teacher will demonstrate method of preparation of any one disperse system among gels, emulsions, suspensions, foams, and Students will individually prepare different form under the supervision of teacher. (2 hours) 2. Students will prepare a Colloidal Dispersion (Emulsion) using a surfactant and study its properties. Mix known quantity of oil and water in a beaker. Add a small amount of surfactant. Stir vigorously to form the emulsion. Perform a centrifugation test to check the stability of the emulsion. This will help them in understanding surface tension, emulsification, stability of colloidal systems. (4 hours) OR 2. Students will prepare a Solid Dispersion (Suspension) i.e. a suspension of solid particles in a liquid and study the settling behaviour. Mix coarse powder of a drug with water to form a suspension. Stir thoroughly and pour into a graduated cylinder. Measure the rate at which the drug powder settles over time. Study the effect of using glycerol to increase the viscosity of the medium. This will help them in identifying the settling velocity and understand Stoke's law, viscosity, and suspension. (4 hours) OR 2. Students will be asked to assess the effect of different Surfactants on Stability of Colloidal dispersions. Prepare colloidal dispersions using different surfactants. Monitor the stability of the dispersions by observing their appearance and behaviour over time (e.g., creaming, coalescence). Further, measure the zeta potential of the colloidal systems to assess their stability. This will enable them to understand the nature of different surfactants, stability, zeta potential, coalescence. (4 hours)
Practical Training 3.3 Rheology
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate the method of measuring viscosity of different pharmaceutical fluids to the class. (1 hour) 2. Students will measure and analyze the viscosity of pharmaceutical suspensions. Prepare suspensions using various concentrations of active ingredients and excipients (e.g., *Samagh Arabi* (Acacia), *Kateera* (Tragacanth), xanthan gum, Carbopol, etc). Use a Viscometer to measure the viscosity of each sample. The

viscosity may be measured at different shear rates (e.g., 10 rpm, 50 rpm, etc.). Plot viscosity versus shear rate to analyze the rheological behavior of the suspension (e.g., Newtonian, shear-thinning). This will help them to understand the shear-thinning (pseudoplastic) nature of suspensions and the effects of excipients on viscosity. (3 hours) OR 2. Students will perform practical to evaluate the flow behavior of semi-solid Unani dosage forms. Prepare semi-solid formulations like creams, ointments, and gels using different concentrations of gelling agents (e.g., carbopol, hydroxyethyl cellulose, gum). Observe the flow property to learn about the rheology of semi-solids and how different formulation components influence flow and spreadability. (3 hours)
Practical Training 3.4 Bioavailability
(Total duration of Activity: 2 hours) 1. Teacher will demonstrate the different factors that impact on Bioavailability of Unani medicines. (30 minutes) 2. Students will observe the effect of Particle Size on Drug Dissolution and Bioavailability. The objective will be to investigate how the particle size of a drug affects its dissolution rate and bioavailability. Prepare the same drug in different forms (e.g., coarse powder, fine powder, and micronized powder). Dissolve each form in a simulated gastric solution. Measure the rate of dissolution using a dissolution apparatus. Record the time taken for complete dissolution. Discuss about the fact that smaller particle sizes generally increase surface area, leading to faster dissolution and possibly enhanced bioavailability. (1 hour 30 minutes) OR 2. Students will study the that how the pH of the stomach or intestinal environment affects the solubility and absorption of a drug. Prepare different buffer solutions with varying pH levels (e.g., pH 1.2, 4.5, and 7.5). Add a drug to each solution and monitor the solubility and absorption rates. Measure the concentration of the drug in solution at different time intervals. Learners will observe that some drugs are more soluble in acidic or basic environments, which impacts their absorption and bioavailability. (1 hour 30 minutes)
Practical Training 3.5 Pharmaceutical pre-formulation
(Total duration of Activity: 4 hours) 1. Teacher will demonstrate the different factors considered during pharmaceutical pre-formulation through practicals/ power point/ videos. (1 hour)

2. Students will perform a practical to determine the melting point of a drug compound, which can provide information on its purity and physical properties. Use a melting point apparatus to measure the melting point of a drug substance. Compare the measured melting point with literature values to assess purity or detect any impurities. Students will learn how melting point data can be useful in confirming the identity and purity of a drug compound, which is important in pre-formulation. (3 hours) OR 2. Students will perform Hygroscopicity Testing to evaluate the moisture absorption properties of a drug substance. Place a sample of the drug substance in a controlled environment with varying humidity levels. Periodically weigh the sample to detect any changes in weight due to moisture absorption. Use the data to determine the hygroscopic nature of the drug and its suitability for different dosage forms. This will help them to understand the importance of hygroscopicity in the development of solid dosage forms and how moisture can affect drug stability. (3 hours) OR 2. Students will perform Flowability and Compressibility Testing to evaluate the flow and compressibility properties of a drug powder, which are important for tablet formulation. Measure the bulk density, tapped density, and compressibility index of the drug powder using a powder flow analyzer. Perform a flowability test using an angle of repose method to determine the powder's flow properties. Analyze the data to assess the suitability of the powder for tablet formulation. Students will learn how powder properties, such as flowability and compressibility, impact the development of solid dosage forms like tablets and capsules. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 3.1: Dosage form designing
(Total duration of Activity: 5 hours) 1. Students will be given individual task to select any classical Unani formulation, prepare and practically demonstrate the method to whole class. (5 hours) OR 1. Students may be given an individual task work for preparing a project/ model on any classical Unani formulation. (5 hours)
Experiential-Learning Learning 3.2: Disperse systems

(Total duration of Activity: 9 hours)

1. Students will be asked to create Edible Emulsions (Herbal Mayonnaise or Salad Dressing) to understand the principles of emulsions, surfactants, and colloidal systems by creating everyday products. Students should arrange eggs, oil, vinegar or lemon juice, mustard, salt, any suitable drug and a blender or whisk. Combine egg yolk (natural emulsifier) with vinegar or lemon juice in a bowl along with small amount of powdered drug. Slowly add oil while whisking vigorously to form a stable emulsion (herbal mayonnaise or salad dressing). Discuss how surfactants like lecithin in egg yolk stabilize the oil-water dispersion. This helps them in understanding about emulsions, surfactants, colloids, stability of disperse systems. Learners will observe firsthand the difference between a homogeneous solution and a dispersed system. The physical activity of creating the emulsion reinforces how emulsifiers work at the molecular level. (9 hours)

OR

1. Students will be asked to compare Colloidal Systems Using Different Liquids (Tyndall Effect). The objective will be to explore the Tyndall effect and distinguish between true solutions, colloids, and suspensions. Take different colloidal suspensions (milk, starch solution, saltwater). Shine a laser beam through each system and observe the scattering of light in colloidal suspensions versus the absence of scattering in true solutions. Discuss the particle size and the way colloids scatter light. By actively engaging in the Tyndall effect demonstration, learners get to see the difference in light scattering between various types of disperse systems and how particle size influences the appearance of systems. (9 hours)

OR

1. Hands-on training/ workshop on pharmaceutical development of various disperse systems. (9 hours)

Experiential-Learning Learning 3.3: Rheology

(Total duration of Activity: 5 hours)

1. Students will perform simple DIY activity to experience how emulsions and gels are made and how their rheological properties affect performance. Prepare different types of emulsions (oil-in-water and water-in-oil) and gels using various emulsifiers (e.g., Tween 80, Span 80, Carbopol, HPMC). Observe and document the appearance, texture, and spreadability. Use a viscometer to test the viscosity of the emulsions and gels at different shear rates. Discuss the effects of emulsifiers and gelling agents on texture, spreadability, and stability. Also, perform an emulsion stability test by storing formulations under different conditions and

observing phase separation or creaming. Learners will explore the practical challenges in formulating emulsions and gels, focusing on rheological properties and stability. (5 hours) OR 1. Students will explore Rheology and Sensory Evaluation and assess how rheological properties affect the sensory qualities of pharmaceutical formulations. Prepare different formulations (e.g., creams, lotions, gels) with varying rheological properties (viscosity, spreadability, and tackiness). Test the sensory characteristics of these formulations by applying them to the skin and asking participants to rate the formulations on texture, ease of spreading, greasiness, and comfort. Discuss how rheology affects consumer preference and product acceptability in terms of user experience. This will enable them to learn how the rheological properties of topical formulations can impact user satisfaction and therapeutic outcomes. (5 hours)
Experiential-Learning Learning 3.4: Bioavailability
(Total duration of Activity: 3 hours) 1. Students will be asked to perform a group task to understand how drug formulation impacts bioavailability. Provide students with different drug forms (e.g., tablet, capsule, syrup, *majoon*, etc) and ask them to dissolve them in water or a simulated gastric fluid solution. Observe how long it takes for each formulation to dissolve completely and observe how dissolution affects the absorption rate. Use various formulations of a real drug to show how slow-release or extended-release forms affect bioavailability over time. Learners will appreciate how pharmaceutical formulations influence the rate and extent of drug absorption and bioavailability. (3 hours) OR 1. Peer group discussion/ Brainstorming on scope and need of bioavailability in dosage form designing. (3 hours) OR 1. Meta analysis/ Power point/ Journal club presentation on application and importance of bioavailability in dosage form designing. (3 hours)
Experiential-Learning Learning 3.5: Pharmaceutical pre-formulation
(Total duration of Activity: 4 hours)

1. Students will be divided in groups to simulate the compatibility testing of a drug substance with various excipients. Provide students with a selection of excipients (e.g., binders, fillers, lubricants, etc.) and a model drug substance. In groups, have them "mix" the drug with different excipients to simulate potential formulation options. Observe and document any changes (e.g., color change, formation of precipitates) that may occur when combining the drug with different excipients. Discuss which excipients are most likely to be compatible with the drug and which might cause stability issues. This will help Students to understand the importance of excipient compatibility and how interactions between the drug and excipients can affect the stability and performance of the final formulation. (4 hours) OR 1. Students will perform a group task to study the effect of temperature on the physical and chemical stability of drug substances. Prepare drug samples and expose them to different temperature conditions (e.g., 4^{o}C, room temperature, and 40^{o}C). Over time, monitor changes in drug appearance (e.g., discoloration, crystal formation) or other physico-chemical parameters or measure the concentration of the drug using UV-Vis spectrophotometry. Discuss how temperature variations can influence the stability of the drug substance. Students will learn how temperature affects the stability of drug substances and the importance of controlling temperature during storage and formulation. (4 hours) OR 1. Students will simulate accelerated aging conditions to assess the stability of a drug substance or formulation. Expose drug formulations to elevated temperature (e.g., 40^{o}C), humidity (e.g., 75%), or light for specific periods. Monitor changes in physical properties (e.g., color, hardness, and appearance) or chemical stability (e.g., degradation products). Analyze the data to determine the shelf-life and stability of the formulation under these conditions. Students will learn how to conduct accelerated stability testing to predict the long-term stability of formulations. (4 hours) OR 1. Hands on training/ workshop on pharmaceutical pre-formulation. (4 hours)
Modular Assessment

Assessment	**Hour**

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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Problem-Based Assessments (25 marks) • Understanding the Problem - 5 Marks • Approach & Problem-Solving Skills - 10 Marks • Analysis & Justification- 5 Marks • Presentation & Communication- 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Assignment (Analytical type) (20 marks) • Conceptual Understanding - 5 Marks • Research & Content - 10 Marks • References & Originality – 5 Marks Or Any practical in converted form can be taken for assessment. (25 Marks) and	4

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

Module 4 : Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine یونانی دواسازی میں ترسیل ادویہ کے جدید نظام کا انضمام

Module Learning Objectives

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

1. Identify the fundamentals, scope, and classification of Novel Drug Delivery Systems (NDDS), along with key terminologies and their applications in Unani medicine.
2. Differentiate between various NDDS approaches, including transdermal, ocular, nasal, pulmonary, colon, rectal, and vaginal drug delivery systems, evaluating their advantages, limitations, and delivery devices.
3. Evaluate the role and future potential of NDDS in improving Unani medicinal formulations, focusing on drug permeability, controlled release mechanisms, and innovative drug delivery techniques.

Unit 1 Introduction to NDDS جدید نظامِ ترسیل ادویہ کا تعارف

4.1.1 Definition, potential scope & applications of NDDS in Unani Medicine

References: 158,242,243,244,245,246,253,254,255,370,371,372

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Discuss the scope and significance of Novel Drug Delivery Systems (NDDS) in Unani medicine	2	Lecture	CC	Knows-how	L,L_VC,L&GD,L&PPT
CO1,CO2,CO3	Identify and analyze different NDDS approaches applicable to Unani formulations through case studies	4	Practical4.1	CAP	Shows-how	DIS,DL,D,PER
CO1,CO2,CO3	Evaluate the potential benefits and challenges of NDDS in enhancing the efficacy, bioavailability, and patient compliance of Unani medicines	2	Experiential-Learning4.1	CAN	Does	DIS,BS,PAL,PER,TBL

Unit 2 Transdermal drug delivery system (TDDS) نظام ترسیل ادویہ براہ جلد

4.2.1 Introduction, Importance, Advantages & Limitations of TDDS

4.2.2 Transdermal drug permeability enhancement

4.2.3 Basic component of TDDS and Transdermal Delivery Devices

4.2.4 Scope of TDDS in Unani Medicine

References: 237,238,239,241,242,243,244,245,246,253,254,373,374,375,376,377,413,414

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Discuss the concept, importance, advantages, and limitations of Transdermal Drug Delivery Systems (TDDS) in pharmaceutical applications.	2	Lecture	CC	Knows-how	L&GD,L&PPT,L_VC,L
CO1,CO2,CO3	Demonstrate different transdermal drug permeability enhancement techniques and analyze their impact on drug absorption.	4	Practical4.2	CAP	Shows-how	PAL,DL,D,PER,DIS
CO1,CO2,CO3	Evaluate the components, devices, and potential scope of TDDS in Unani medicine for improving drug delivery and therapeutic outcomes.	6	Experiential-Learning4.2	CAN	Does	PrBL,DIS,BS,PAL,PER

Unit 3 Ocular & Nasal Drug Delivery Systems نظام ترسیل ادویہ برائے عین وانف

4.3.1 Introduction, Importance, Advantages & Limitations

4.3.2 Scope of Ocular & Nasal Drug Delivery Systems in Unani Medicine

References: 230,237,239,241,242,243,244,245,246,253,254,378,379,380,381

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concept, importance, advantages, and limitations of ocular and nasal drug delivery systems	2	Lecture	CC	Knows-how	L,L_VC,L&GD,L&PPT

CO1,CO2,CO3	Identify and analyze different approaches for ocular and nasal drug delivery, assessing their role in targeted and sustained drug release.	4	Practical4.3	CAP	Shows-how	PAL,PER,D,DIS
CO1,CO2,CO3	Appraise the potential applications and challenges of integrating ocular and nasal drug delivery systems into Unani medicine for enhanced therapeutic effectiveness.	6	Experiential-Learning4.3	AFT-SET	Does	DIS,BS,JC,PAL,TUT

Unit 4 Pulmonary drug delivery system نظام ترسیل ادویہ ریوی

4.4.1 Introduction, Importance, Advantages & Limitations

4.4.2 Pulmonary drug delivery devices

4.4.3 Scope of Pulmonary drug delivery system in Unani Medicine

References: 239,240,241,242,243,244,245,246,253,254,382,383,384

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Describe the concept, importance, advantages, and limitations of pulmonary drug delivery systems.	2	Lecture	CC	Knows-how	L&GD,L_VC,L&PPT ,L
CO1,CO2,CO3	Demonstrate the working principles of pulmonary drug delivery devices, such as nebulizers, inhalers, and dry powder inhalers, and assess their role in drug administration.	4	Practical4.4	CAP	Shows-how	SIM,PAL,DIS,PER,PL
CO1,CO2,CO3	Evaluate the potential applications and challenges of incorporating pulmonary drug delivery systems into Unani medicine for improved respiratory treatments.	6	Experiential-Learning4.4	CE	Does	BS,DIS,LS,PAL,JC

Unit 5 Colon, rectal & vaginal drug delivery systems نظام ترسیل ادویہ برائے قولون، مقعد و مہبل

4.5.1 Introduction, Importance, Advantages & Limitations

4.5.2 Methods and drug delivery devices for Colon, Rectum & Vagina

4.5.3 Scope in Unani Medicine

References: 237,238,239,240,241,242,243,244,245,246,253,254,385,386,387,388,389

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO3	Discuss the concept, importance, advantages, and limitations of colon, rectal, and vaginal drug delivery systems	2	Lecture	CC	Knows-how	L&PPT,L_VC,L&GD,L
CO1,CO2,CO3,CO4	Demonstrate the formulation and evaluation of a basic colon, rectal, or vaginal drug delivery system, assessing factors like drug release and absorption.	4	Practical4.5	CAP	Shows-how	D,PL,DIS,PER,SIM
CO1,CO2,CO3	Analyse the potential applications and challenges of incorporating these drug delivery systems into Unani medicine for targeted and sustained therapeutic effects.	6	Experiential-Learning4.5	CAN	Does	DIS,D,PL,JC,PER

Practical Training Activity

Practical Training 4.1 Novel drug delivery systems

(Total duration of Activity: 4 hours)

1. Teacher will demonstrate the scope and application of NDDS through power point/ videos. (1 hour)

2. Students will be encouraged for brainstorming and group discussion to explore the relevance and application in Unani pharmaceutical sciences. (3 hours)

Practical Training 4.2 Transdermal drug delivery system

(Total duration of Activity: 4 hours)

1. The teacher will demonstrate the scope and application of Transdermal drug delivery system through simple and feasible practical based on evaluation of marketed sample of any transdermal dosage form or through power point/ videos. (1 hour) 2. Students will perform a practical based on characterization of a transdermal patch procured from open market. Parameters like pH, thickness uniformity, folding endurance, skin irritation, etc will be assessed. (3 hours)
Practical Training 4.3 Ocular & Nasal drug delivery systems
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate the scope and application of Ocular & Nasal drug delivery system through power point/ videos. (1 hour) 2. Students will perform a practical to evaluate the different physico-chemical parameters from a marketed ocular gel/ drop and understand the factors affecting ocular drug delivery. They will learn about the standard parameters to be tested in ocular formulation. They will understand how the formulation's pH, viscosity, solubility, and other parameters affect drug delivery to the eye. (3 hours)
Practical Training 4.4 Pulmonary drug delivery system
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate the scope and application of Pulmonary drug delivery system through nebulizers, inhalers etc. or through power point/ videos. (1 hour) 2. Students will be encouraged for Brainstorming or group discussion to draw meaningful outcomes on designing a Pulmonary drug delivery system in Unani pharmaceutics. (3 hours)
Practical Training 4.5 Colon, Rectal & Vaginal drug delivery systems
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate the scope and application of Colon, Rectal & Vaginal drug delivery system through power point/ videos. (1 hour) 2. The students will be encouraged for group discussion and then individually asked to select one topic (i.e. drug coating for targeted delivery, valigal suppositories, rectal suppositories, enema, etc) and present their understanding in the class. (3 hours)

Experiential Learning Activity
Experiential-Learning Learning 4.1: Novel drug delivery systems (NDDS)
(Total duration of Activity: 2 hours) 1. Peer group discussion/ Brainstorming on scope and application of NDDS in Unani medicine. (2 hours) OR 1. Meta analysis/ Power point/ Journal club presentation on application and importance of NDDS in Unani medicine. (2 hours)
Experiential-Learning Learning 4.2: Transdermal drug delivery system
(Total duration of Activity: 6 hours) 1. The students will perform a learning task in group, to evaluate the release of a model drug from a transdermal patch and discuss how different factors affect the drug's release profile. They will arrange a Transdermal patch (commercially available or prepared in the lab), cellophane or any other artificial membrane, Release medium (e.g., phosphate buffer solution or saline), Franz diffusion cell or simple beaker setup for diffusion, UV-Vis spectrophotometer or HPLC (optional) for drug quantification, Stopwatch or timer, pH meter (optional), Temperature-controlled water bath (optional), Analytical balance, Tweezers, Magnetic stirrer or Stirring rod. They will set up the Diffusion System, placing the membrane between the donor and receptor compartments of the diffusion cell. If Franz diffusion cell is not available, use a simple setup with a beaker and a membrane. Place the transdermal patch on the donor compartment (the part that will be in contact with the simulated skin/ membrane). If the patch is adhesive, make sure it adheres properly. Add the release medium (simulated body fluid like phosphate buffer or saline) to the receptor compartment. The receptor fluid should cover the membrane and be agitated gently to maintain uniform distribution. Start the experiment by placing the system in a temperature-controlled environment (usually 37^{o}C to simulate body temperature) or in a water bath or over a hot plate magnetic stirrer. Monitor the release of the drug by periodically withdrawing samples of the receptor fluid (e.g., every 30 minutes or 1 hour). Quantify the drug using a UV-Vis spectrophotometer or HPLC to measure the concentration of the drug in the receptor fluid. In case of UV-Vis, measure at the drug’s specific absorbance wavelength. Record the volume of sample withdrawn and replace it with fresh medium to maintain constant volume. Plot the drug concentration over time to generate a release profile. Calculate the cumulative drug release at each time point. Compare the release rate from the patch to evaluate how the drug release behaves over time. To further study the impact of temperature (optional), repeat the experiment at different temperatures (e.g., 25^{o}C, 32^{o}C, and 40^{o}C) and

observe how temperature affects drug release. The students will learn and understand about how drugs are released from transdermal patches and how factors like membrane permeability and patch composition affect the rate of drug diffusion. It will also introduces them to Diffusion Mechanism, Practical Application and Formulation Considerations. They will discuss about the factors affecting drug release, application to medicine and the limitations and challenges in developing transdermal systems. (6 hours)

OR

1. Students will be given a group task work for preparing a project/ model on Transdermal drug delivery system. (6 hours)

Experiential-Learning Learning 4.3: Ocular & Nasal drug delivery systems

(Total duration of Activity: 6 hours)

1. Students will be given a group task to formulate and evaluate a nasal spray, focusing on factors such as drug release, spray consistency, and formulation stability. In groups, students select a model drug (Normal Saline) and then design a nasal spray formulation, which typically includes a drug solution, buffer (to adjust pH), and stabilizers or preservatives (e.g., benzalkonium chloride). Group decides whether to include excipients to improve drug solubility or surfactants to enhance bioavailability. Students will prepare a nasal spray solution by dissolving the model drug in the chosen vehicle. They will use a spray bottle or atomizer for the formulation, ensuring the proper size of droplets (e.g., aiming for droplets with a size of 10-20 microns for optimal nasal deposition). Students can modify the spray by adding excipients and adjusting the pH to optimize drug absorption. Students will evaluate the spray consistency by assessing the uniformity and size distribution of the droplets using a simple spray pattern test (e.g., spraying onto paper and analyzing droplet distribution). They will also assess the delivery efficiency of the nasal spray by spraying a known amount onto a simulated nasal mucosa (synthetic membrane) and measuring the amount of drug deposited in the receptor compartment. In Vitro Drug Release Study (optional) can be done using a Franz diffusion cell using synthetic nasal membrane (or mucosal model) to simulate drug diffusion across the nasal mucosa and UV-Vis spectrophotometry is used to measure drug concentrations in the receptor fluid. After the initial formulation, students can store their nasal spray formulation under different conditions (e.g., room temperature, 4^{o}C) and assess its stability over time (e.g., after 1 week). The group presents their nasal spray formulation and findings, including spray consistency, stability data, drug release profiles, and potential improvements. A discussion on optimizing nasal drug delivery (e.g., enhancing bioavailability) follows. The students will gain hands-on experience in preparing

nasal spray formulations and understanding the factors that affect nasal drug delivery. They will learn how to evaluate the spray characteristics and drug release, focusing on the consistency of the spray. (6 hours) OR 1. Peer group discussion/ Brainstorming on scope and application of Ocular & Nasal drug delivery system in Unani medicine. (6 hours)
Experiential-Learning Learning 4.4: Pulmonary drug delivery system
(Total duration of Activity: 6 hours) 1. Students will be asked to formulate a herbal-based nebulizer solution (e.g. using *Arq-e-Ajeeb*) and pharmaceutically evaluate it. They will prepare *Arq-e-Ajeeb* in lab. or arrange for it from market, Phosphate-buffered saline (PBS) or simulated lung fluid (e.g., saline solution), Nebulizer (e.g., jet nebulizer), Surfactant (optional). Prepare the nebulizer solution by dissolving or suspending the *arq* in phosphate-buffered saline (PBS) or simulated lung fluid. If needed, add a suitable surfactant to help the *arq* dissolve properly. Adjust the pH of the solution to be around 7.4 to mimic the physiological pH of the respiratory tract. Perform pharmaceutical characterization based on different physico-chemical parameters and discuss the results in class. The students will learn how to formulate herbal-based nebulizer solutions and understand the challenges of solubilizing herbal extracts for pulmonary delivery. They will explore how herbal compounds can be delivered effectively to the lungs for respiratory therapeutic purposes. (6 hours) OR 1. Students may be given a group task work for preparing a project/ model on Pulmonary drug delivery system. (6 hours)
Experiential-Learning Learning 4.5: Colon, Rectal & Vaginal drug delivery systems
(Total duration of Activity: 6 hours) 1. The teacher will ask the students to collect a few classical formulations of *humool* or *firzaja*. Then the students will modify and formulate suppository based on that formulation using suitable base material (e.g., cocoa butter, PEG, glycerin, or beeswax) and incorporating it in suppository molds (plastic or metal). Finally the formulation will be evaluated on few parametrs like pH, melting point, disintegration and dissolution time and present their findings in the class. This will help the students to learn how to formulate rectal suppositories and understand the selection of base materials for different types of drugs. They will evaluate the release

and disintegration profiles of suppositories to understand the factors affecting suppository formulation and will gain insight into their regulatory standards too. (6 hours)

OR

Meta analysis/ Power point/ Journal club presentation on application and importance of Colon, Rectal & Vaginal drug delivery system in Unani medicine. (6 hours)

Modular Assessment

Assessment	**Hour**
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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Assignment or Research report (25 marks) • Conceptual Understanding - 5 Marks • Research & Content - 10 Marks • Critical Evaluation & Logical approach - 5 Marks • References & Originality – 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks • Short Answer Questions – 10 Marks	4

2. Project work (20 Marks)

- Research & Content – 10 Marks
- Presentation & Creativity - 5 Marks
- Viva Voce & Explanation - 5 Marks

Or

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

and

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

Semester No : 5

Module 5 : Conventional Pharmaceutical Dosage Forms روایتی اشکال ادویہ

Module Learning Objectives

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

1. Describe the principles, advantages, limitations, and formulation techniques of conventional pharmaceutical dosage forms, including solid, liquid, and semi-solid preparations.
2. Differentiate between various specialized pharmaceutical delivery systems such as aerosols, modified-release formulations, and pediatric/geriatric dosage forms, assessing their formulation strategies and applications in Unani medicine.
3. Evaluate the role of excipients, manufacturing equipment, and quality control parameters in dosage form development to ensure efficacy, stability, and patient compliance.

Unit 1 Solid dosage forms جامد اشکال ادویہ

5.1.1 Introduction, Advantages & Limitations of Solid Dosage Form

5.1.2 Powders- Definition, application and methods of preparing different powder forms

5.1.3 Granules- Definition, application, methods of preparing different granules and equipment used (granulators)

5.1.4 Pills and Tablets

5.1.4.1 Types, preparation methods, excipients used

5.1.4.2 Tablet tooling

5.1.4.3 Equipment used- Pill making machine, Tablet making machine

5.1.4.4 Coating materials and composition, Pill/ Tablet coating pan

5.1.4.5 Testing apparatus- Hardness testers, Disintegration time testing apparatus, Dissolution time testing apparatus, Friability test apparatus

5.1.5 Capsules

5.1.5.1 Hard & Soft capsules manufacturing

5.1.5.2 Capsule filling machines

References: 237,238,239,240,241,242,243,244,245,246,247,248,253,254,255,257,261,262,263,276,390,391,392,393,394,395

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Discuss the concept, advantages, and limitations of solid dosage forms, including powders, granules, pills, tablets, and capsules along with excipients required in their preparation	3	Lecture	CC	Knows-how	L&PPT ,EDU,DIS,L_VC
CO1,CO2	Demonstrate the Formulation and preparation of different solid dosage forms using appropriate techniques, excipients, and equipment.	6	Practical5.1	PSY-GUD	Shows-how	D,DIS,BS,PT, DL
CO1,CO2	Apply different equipment used for solid dosage forms in factory setting.	9	Experiential-Learning5.1	AFT-VAL	Does	JC,PT,FV,D

Unit 2 Liquid dosage forms سیال اشکال ادویہ

5.2.1 Introduction, Advantages & Limitations of Liquid Dosage Form

5.2.2 Oral liquid dosage forms

5.2.2.1 Peculiarities of oral liquid dosage forms

5.2.2.2 Definition and preparation of *Ābiyat & Murawwaq* (Clarified solutions), '*Araq* (medicinal distillate), *Sharbat* (Syrup), Oral suspension and emulsion, Linctus, Elixir

5.2.3 Topical liquid dosage forms

5.2.3.1 Peculiarities of topical liquid dosage forms

5.2.3.2 Definition and preparation of Topical solutions, *Ravghan* (oil), *Ṭilā'* (liniments), Lotions

5.2.4 Eye, Ear & Nasal preparations

5.2.4.1 Peculiarities of such dosage forms

5.2.4.2 Definition and preparation of drops

References: 237,238,239,240,241,242,243,244,245,246,247,248,253,254,261,262,276,393

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Describe the concept, advantages, limitations, and classification of liquid dosage forms, including oral, topical, and specialized (eye, ear, nasal) preparations.	3	Lecture	CC	Knows-how	L&GD,BS,L&PPT
CO1,CO2	Demonstrate the preparation of different liquid dosage forms such as *Aabyat, Arq, Sharbat*, emulsions, suspensions, liniments, and medicinal oils.	6	Practical5.2	PSY-GUD	Shows-how	DIS,W,JC,D,PT
CO1,CO2	Analyze the formulation challenges, stability factors, and effectiveness of liquid dosage forms in Unani medicine, evaluating their impact on therapeutic efficacy	8	Experiential-Learning5.2	CAN	Does	PL,PER,DIS,PT,D

Unit 3 Semi solid dosage forms نیم جامد اشکال ادویہ

5.3.1 Introduction, Advantages & Limitations of Semi Solid Dosage Forms

5.3.2 Oral Semi Solid Dosage Forms (*Qiwāmi Advia*)

5.3.2.1 Types, Methods of preparation, Peculiarities of different oral semi solid dosage forms

5.3.2.2 Equipment used such as Electric churner, Mixers, Refractometer

5.3.3 Topical Semi Solid Dosage Forms

5.3.3.1 Peculiarities of different topical semi solid dosage forms

5.3.3.2 Definition and preparation of *Marham* (ointments),*Ḍimād* (pastes) and Creams

References: 237,238,239,240,241,242,243,246,247,248,253,254,261,262,276

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Describe the concept, advantages, limitations, and classification of semi-solid dosage forms, including oral and topical formulations.	2	Lecture	CC	Knows-how	DIS,L,L&GD,PER,L&PPT
CO1,CO2,CO6	Demonstrate the preparation of various semi-solid dosage forms such as *Qiwami Advia*, *Marham* (ointments), *Zimad* (pastes), and creams using appropriate equipment.	4	Practical5.3	PSY-GUD	Shows-how	DL,JC,DIS,PT,W
CO1,CO2	Analyze the formulation techniques, stability concerns, and therapeutic effectiveness of semi-solid dosage forms in Unani medicine, assessing their impact on drug absorption and efficacy.	6	Experiential-Learning5.3	CAN	Does	PER,JC,BS,D,DIS

Unit 4 Pharmaceutical aerosols بخاری اشکال ادویہ

5.4.1 Introduction, scope & application of Aerosols

5.4.2 Types & components of aerosol systems

5.4.3 Aerosol filling methods and machinery

References: 242,243,244,245,246,247,248,249,250,253,254,261,262,276

3A	3B	3C	3D	3E	3F	3G
CO1,CO6	Describe the concept, scope, applications, and advantages of pharmaceutical aerosols in drug delivery	2	Lecture	CC	Knows-how	BS,LS,TPW,L &GD,ML
CO1,CO6	Demonstrate the process of aerosol formulation and filling using appropriate machinery and techniques	4	Practical5.4	PSY-GUD	Shows-how	JC,DIS,FV,DL, D
CO1,CO6	Identify appropriate Aerosols filling methods for different aerosol formulations	6	Experiential-Learning5.4	AFT-REC	Does	EDU,JC,BS,W, SDL

Unit 5 Modified-release dosage forms ترمیم شدہ اخراج کی حامل اشکال ادویہ

5.5.1 Introduction, scope & application of Modified-release dosage forms

5.5.2 Common Terminologies used: Modified-Release (MR) Dosage Form, Extended-Release (ER) Dosage Form, Controlled Release (CR) Dosage Form, Prolonged Release (PR) Dosage Form, Sustained Or Slow Release (SR) Dosage Form and Long-Acting (LA) Dosage Form

5.5.3 Factors to be considered while formulating MR dosage forms

References: 242,243,244,245,246,247,248,249,250,252,253,254,256,257,261,262,276

3A	3B	3C	3D	3E	3F	3G
CO1,CO6	Recall the concept, scope, and apply modified-release (MR) dosage forms and differentiate between various terminologies such as Extended-Release (ER) Dosage Form, Controlled Release (CR) Dosage Form, Prolonged	3	Lecture	CAP	Knows-how	PER,L_VC,D,L &PPT ,DIS

	Release (PR) Dosage Form, Sustained Or Slow Release (SR) Dosage Form and Long-Acting (LA) Dosage Form.					
CO1,CO6	Apply formulation principles in the design of extended-release, delayed-release, targeted-release, oral, and fast-dissolving dosage forms.	6	Practical5.5	PSY-GUD	Shows-how	W,SY,PBL,JC,D
CO1,CO6	Analyse designing of extended & delayed release, target-release, oral & fast dissolving dosage forms and compare their therapeutic benefits, challenges, and impact on patient outcomes	6	Experiential-Learning5.5	CAN	Does	ML,PER,D,LS,DIS
Unit 6 Paediatric & Geriatric dosage forms اشکال ادویہ برائے اطفال و مشائخ 5.6.1 Introduction, Importance and Factors to be considered in formulating Paediatric & Geriatric dosage forms 5.6.2 Future trends & possibilities in Unani System of Medicine **References:** 242,243,244,245,246,247,248,249,251,252,253,254,261,262,269,276						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO1,CO6	Describe the significance and key considerations in formulating paediatric and geriatric dosage forms, including patient-specific requirements.	2	Lecture	CC	Knows-how	SDL,L&GD,BS,L&PPT
CO1,CO6	Prepare various commonly used dosage forms for pediatric and geriatric patients.	4	Practical5.6	PSY-GUD	Shows-how	DL,W,JC,PrBL,DIS
CO1,CO2	Assess emerging trends and advancements in paediatric and geriatric formulations in the Unani system of medicine, evaluate their potential impact on patient safety and therapeutic effectiveness.	4	Experiential-Learning5.6	CE	Does	PT,D-M,PER,JC,PL
Practical Training Activity						

Practical Training 5.1 Solid dosage forms
(Total duration of Activity: 6 hours) 1. Teacher will demonstrate the preparation and evaluation methods of different solid dosage forms. (2 hours) 2. Students will prepare tablets using various excipients and methods (wet granulation, dry granulation, direct compression) by preparing a powder mixture of drugs and excipients like binders, fillers, and lubricants. Granulate the mixture using wet or dry methods. Compress the granules into tablets using a tablet press. Marketed samples of tablets can also be taken. Students will then evaluate different standard parameters like disintegration and dissolution time of tablets, hardness and friability. This will help them to understand the formulation of tablets, role of excipients, and the compression process. Further, they will understand the different testing methods and their importance. (4 hours) OR 2. Students will determine the bulk density and tapped density and Hausner's ratio of powder used in solid dosage forms. Measure the volume and mass of a known weight of powder. Calculate bulk density and tapped density by measuring the volume change upon tapping. Compare both values to calculate Hausner's ratio. This will help them to understand the relevance of density in powder flow properties and its role in developing other dosage forms (e.g. tablet manufacturing). (4 hours) OR 2. Students will determine the moisture content in powders or tablets. Weigh a sample of powder or tablets, then dry it in an oven at a specific temperature and time. Measure the weight loss to calculate the moisture content. This helps them to understand the effect of moisture content on the stability and quality of solid dosage forms. (4 hours)
Practical Training 5.2 Liquid dosage forms
(Total duration of Activity: 6 hours) 1. The teacher will demonstrate the method of preparation of different liquid dosage forms. (2 hours) 2. Students will be asked to prepare different classical formulations of *Arq, Sharbat, Roghan* and pharmaceutically evaluate the prepared dosage forms. Students will learn how to prepare and formulate oral and topical liquid dosage forms, focusing on the selection of excipients and the process of formulation. They will

understand the importance of various parameters such as viscosity and pH in the performance and stability of liquid dosage forms. They will further perform stability studies to evaluate the impact of temperature and time on the drug product. (4 hours)
Practical Training 5.3 Semi solid dosage forms
(Total duration of Activity: 4 hours) 1. The teacher will demonstrate different methods used for making oral and topical semi solid Unani dosage forms. (1 hour) 2. Students will perform practicals for preparing various oral semi solid dosage forms (such as *Itrifal, Jawarish, Majoon, Khamira*, etc) and topical semisolid dosage forms (such as *Zimad, Marham, Cream*, etc) and pharmaceutically evaluate the formulations. This willl enable them to understand the different preparatory methods and appraise them with different testing parameters. (3 hours)
Practical Training 5.4 **Pharmaceutical aerosols**
(Total duration of Activity: 4 hours) 1. Teacher will display/ demonstrate the different methods of aerosol filling through aerosol filling machine/ power point/ simulation. (1 hour) 2. Students will be encouraged for peer group discussion on aerosols and explore the application in Unani pharmaceutics. (3 hours)
Practical Training 5.5 Modified-release dosage forms
(Total duration of Activity: 6 hours) 1. The teacher will display/ demonstrate the different methods of designing extended or delayed release dosage form through videos/ powerpoint. (2 hours) 2. Students will collect published papers on work done in designing target release dosage form, oral & fast dissolving release dosage form in Unani pharmaceutics and present their findings in class. (4 hours)
Practical Training 5.6 Paediatric & Geriatric dosage forms
(Total duration of Activity: 4 hours) 1. The teacher will display/ demonstrate the different Paediatric and Geriatric dosage forms. (1 hour)

2. Students will explore the published work to know the current status of the work done so far on paediatric and geriatric dosage forms in Unani pharmaceutics and present their data in class. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 5.1: Solid dosage forms
(Total duration of Activity: 9 hours) 1. Students will conduct a Tablet formation workshop to allow learners to design and create their own tablet formulations. Students work in teams to formulate a tablet using various excipients (e.g., binders, disintegrants, lubricants). After formulation, the tablets are compressed using a tablet press. Conduct various tests such as hardness, friability, disintegration, and dissolution to evaluate the quality of their tablets. This will develop problem-solving and critical thinking skills related to tablet formulation and understand the interplay of excipients and processing parameters. (9 hours) OR 1. Students will perform Role-playing in Quality Control to simulate real-world pharmaceutical industry processes, focusing on quality control (QC) and testing procedures. Students take on roles as quality control analysts, regulatory officers, and production staff. Perform laboratory tests on solid dosage forms (e.g., tablet dissolution, content uniformity, friability). Engage in discussions around regulatory standards and how the tests ensure product quality. This will enable them to understand the importance of quality control and regulatory requirements in solid dosage form manufacturing. (9 hours)
Experiential-Learning Learning 5.2: Liquid dosage forms
(Total duration of Activity: 8 hours) 1. Students will be given group task to perform stability and shelf-life testing of Liquid Dosage Forms to provide them with a practical understanding of the factors that affect the stability of liquid formulations and how to perform shelf-life testing. Simulate real-world conditions by storing prepared liquid dosage forms at different temperatures (e.g., room temperature, 4°C, and 40°C) and in light or dark conditions. Every few days, students will inspect the formulations for changes in color, texture, precipitation, and pH. They will document the changes in a stability log and analyze how storage conditions affect the stability. Optionally, they can perform microbial testing. Students test for microbial contamination in the formulations. Using microbial growth media and standard methods, they assess

whether their formulations are free of contaminants. This allows students to understand the role of preservatives in preventing microbial growth in liquid dosage forms. After completing the testing, students analyze the results and prepare a report on their findings, discussing any stability issues and possible solutions (e.g., adjusting preservatives, changing storage conditions). (8 hours)

OR

1. Students will perform activity on Evaluation of Dissolution Profiles of Liquid Dosage Forms to provide them with a better understanding of the dissolution behavior of liquid dosage forms and how it relates to drug release and bioavailability. Design an experiment to evaluate the dissolution rate of an oral liquid formulation, such as syrup or suspension, using a dissolution testing apparatus. Students will collect samples at specified time intervals, filter, and analyze the drug concentration using a UV-Vis spectrophotometer. Discuss the factors affecting the dissolution rate of liquid dosage forms (e.g., viscosity, particle size, pH, and surfactants). Additionally, compare the dissolution profiles of liquid vs. solid dosage forms (e.g., syrup vs. tablet). Students will prepare both types and measure the dissolution rates over time. This comparison will help students understand the advantages of liquid forms in terms of faster onset of action and bioavailability. (8 hours)

OR

1. Students will be divided into groups and asked to formulate Topical Liquid Preparations (Gels and Lotions) to offer hands-on experience in formulating topical liquid dosage forms such as gels and lotions. Students will arrange raw materials (e.g., carbomer, glycerin, emulsifiers, and active ingredients) to prepare gels or lotions. The activity can involve the preparation of a moisturizing gel or anti-inflammatory lotion. Students will mix the drug into the base, add stabilizers and preservatives, and adjust the pH. After preparing the gel or lotion, students will perform spreadability testing and use a viscometer to evaluate the consistency and viscosity of their formulations. This will help them to understand how viscosity influences the ease of application and patient compliance. Further, they will store the products under different conditions and observe for physical changes (e.g., separation, sedimentation, color changes). They will also evaluate the sensory properties such as odor, texture, and spreadability. (8 hours)

Experiential-Learning Learning 5.3: Semi solid dosage forms

(Total duration of Activity: 6 hours)

1. Students will be asked to prepare Unani Cream and perform Stability Study. This will give students experience in preparing Unani creams (used for cosmetic or therapeutic purposes) and evaluating their properties for use in real-world scenarios. Students will select the ingredients or any classical formulation after discussing with their teacher for a soothing or healing cream. They will learn about the properties of these selected medicines, especially their moisturizing and anti-inflammatory effects. The first step in preparation of Cream is to introduce students to emulsification techniques by preparing an oil-in-water or water-in-oil emulsion. Students will combine herbal drugs or extracts with gelling agents (like Carbopol), emulsifiers (like cetyl alcohol or stearic acid), and oils (like almond oil or olive oil) to create a cream base. The prepared Cream will be evaluated for viscosity and spreadability: Measure the viscosity using a viscometer or perform a spreadability test. Students will assess the cream's ability to spread evenly on the skin. Also, check the pH of the cream to ensure it falls within the skin-friendly range (typically pH 4-6). Further, students will store the cream under different temperature conditions and observe any changes in texture, separation, or color change over time. Lastly, they will perform a sensory analysis on the cream, including its texture, odor, and appearance. They will also consider the patient compliance factors like ease of use and comfort. (6 hours)

OR

1. Students will be asked to prepare and evaluate Unani Gels. Introduce students to the concept of gelling agents such as Carbopol, Xanthan gum, or Agar-Agar. Students will prepare a Unani gel by dissolving the gelling agent in distilled water or herbal distillates and incorporating any suitable drug as the active ingredient. Emphasize the importance of homogenizing the mixture to ensure a smooth, uniform gel. Students will test the gel for stability under different storage conditions (temperature, light) to ensure it maintains its consistency and effectiveness over time. Measure the gel's spreadability on a model surface and viscosity using a viscometer. Discuss the desired properties of a gel for patient compliance. Further, assess the sensory properties of the gel, including its texture, odor, and cooling effect on the skin. Discuss how these factors influence patient preference. Through this activity students will gain an understanding of emulsion technology for cream preparation and develop skills in evaluating the stability and sensory properties of topical dosage forms. (6 hours)

Experiential-Learning Learning 5.4: Pharmaceutical aerosols

(Total duration of Activity: 6 hours)

1. Students will be given individual/ group task to prepare any aerosol. (6 hours)

OR

1. Students will be given individual topics for PowerPoint/ Journal Club presentation. (6 hours) OR 1. Hands on Training/ Workshop/ Tutorial on handling of equipment and preparation of aerosols. (6 hours)
Experiential-Learning Learning 5.5: Modified-release dosage forms
(Total duration of Activity: 6 hours) 1. Students will be given individual/ group task to prepare any extended release/ delayed release/ target release/ oral & fast dissolving dosage form using any published data. Alternatively, they can take any modified release dosage form from open market and evaluate it using *in-vitro* testing. Use a dissolution testing apparatus to perform in vitro testing under simulated conditions [simulated gastric fluid (SGF) and simulated intestinal fluid (SIF)]. Analyze the dissolution profiles by plotting cumulative percentage release against time. This will help them to learn the principles behind the evaluation of modified-release dosage forms and understand the importance of dissolution testing in comparing modified-release and immediate-release formulations. (6 hours) OR 1. Students may be given individual topics for PowerPoint/ Journal Club presentation. (6 hours) OR 1. Hands on Training/ Workshop/ Tutorial on pharmaceutical designing of extended release/ delayed release/ target release/ oral & fast dissolving dosage form. (6 hours) OR 1. Students may be given a group task work for preparing a meta-analysis/ project/ model on extended release/ delayed release/ target release/ oral & fast dissolving dosage form. (6 hours)
Experiential-Learning Learning 5.6: Paediatric & Geriatric dosage forms
(Total duration of Activity: 4 hours) 1. Students will be encouraged for Peer group discussion/ Brainstorming on scope, future trends & possibilities in designing Paediatric & Geriatric dosage forms in Unani medicine. (4 hours)

OR

1. Students will be given individual/ group task to prepare any specific Paediatric/ Geriatric dosage form. (4 hours)

OR

1. Students may be given individual topics for PowerPoint/ Journal Club presentation. (4 hours)

Modular Assessment

Assessment	**Hour**
The assessment will be for 75 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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks 3. Assignment or Research report (25 marks) • Conceptual Understanding - 5 Marks • Research & Content - 10 Marks • Critical Evaluation & Logical approach - 5 Marks • References & Originality – 5 Marks	6

Or

1. Written examination (30 marks)

- Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks
- Short Answer Questions – 10 Marks

2. Project work – (20 Marks)

- Research & Content -10 Marks
- Presentation & Creativity -5 Marks
- Viva Voce & Explanation - 5 Marks

3. Oral presentation (Interactive) (25 marks)

- Content & Subject Knowledge -10 Marks
- Communication & Delivery - 5 Marks
- Presentation Skills & Body Language - 5 Marks
- Response to Questions & Interaction -5 Marks

Or

Any practical in converted form can be taken for assessment. (35 Marks)

and

Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (40 Marks)

Module 6 : Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms یونانی اور جدید اشکال ادویہ میں اساس، حامل مرکبات اور منظور شدہ غیر فعال اجزاء

Module Learning Objectives

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

1. Describe the role and importance of bases, vehicles, colorants, flavoring agents, preservatives, sweeteners, surfactants, and emulsifying agents in pharmaceutical formulations.

2. Classify the types of permitted excipients and interpret their regulatory aspects in relation to drug stability, efficacy, and patient compliance.
3. Evaluate the selection and formulation of excipients across different dosage forms, ensuring safety, compatibility, and adherence to pharmaceutical standards.

Unit 1 Bases and Vehicles اساس اور حامل مرکبات

6.1.1 Definition and significance of bases and vehicles in preparation of drug dosage forms

6.1.2 Bases & Vehicles used in Unani and other Conventional dosage forms

References: 158,237,238,239,240,241,242,243,244,245,246,247,248,250,259,261,262,274,275,276,396,397,398,399,400

3A	3B	3C	3D	3E	3F	3G
CO1,CO6	Describe Bases & Vehicles used in Unani and Conventional dosage forms	1	Lecture	CC	Knows-how	L&PPT ,L&GD
CO1	Identify and categorize different bases and vehicles used in Unani and conventional dosage forms based on their composition, properties, and applications.	2	Practical6.1	PSY-GUD	Shows-how	PAL,PT,DIS,D
CO1,CO2	Analyse the use of Bases & Vehicles in different organs/system in Unani and Conventional dosage forms and analyzing their impact on drug stability, efficacy, and patient acceptability.	3	Experiential-Learning6.1	AFT-REC	Does	PER,BS,FV,D,W

Unit 2 Permitted Colorants & Flavoring Agents منظور شدہ اجزاء لونیہ اور اجزاء عطریہ

6.2.1 Introduction and objectives of using Colorants & Flavouring Agents in drug dosage forms

6.2.2 Types of permitted Colorants & Flavouring Agents used in Unani and other Conventional dosage forms

References: 158,237,238,241,242,243,244,245,246,259,261,270,271,274,275,276,396,397,398,399,400

3A	3B	3C	3D	3E	3F	3G

CO1,CO2	Describe the role, importance, and objectives of using colorants and flavouring agents in pharmaceutical dosage forms	1	Lecture	CC	Knows-how	L&PPT ,L&GD,BS
CO1,CO6	Classify suitable Colorants & Flavoring Agents in Unani and Conventional dosage forms	2	Practical6.2	PSY-GUD	Shows-how	DIS,D,JC,PER ,W
CO1,CO6	Assess the selection criteria for colorants and flavouring agents, analyzing their impact on patient acceptance, therapeutic efficacy, and regulatory compliance	3	Experiential-Learning6.2	CAN	Does	TUT,BS,D,PAL ,DIS
Unit 3 Permitted Preservatives منظورشدہ محافظ ادویہ 6.3.1 Definition and significance of Preservatives in drug dosage forms 6.3.2 Types of permitted Preservatives used in Unani and other Conventional dosage forms **References:** 158,238,241,242,243,244,245,246,250,259,263,274,275,276,396,397,398,399,400						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO1,CO2	Describe the significance and necessity of preservatives in drug dosage forms to ensure stability and safety	1	Lecture	CC	Knows-how	L&PPT ,L&GD,FC
CO1,CO2	Identify suitable types of Preservatives used in Unani and Conventional dosage forms based on their mechanisms and applications.	2	Practical6.3	PSY-GUD	Shows-how	DIS,JC,PT,PE R,DL
CO1,CO2	Evaluate the selection criteria for preservatives, assessing their impact on drug stability, microbial protection, and patient safety in Unani and conventional dosage forms	2	Experiential-Learning6.3	CAN	Does	JC,PT,TBL,PE R,DIS
Unit 4 Alternate Sweeteners متبادل اجزاء حلویہ						

6.4.1 Introduction and role of alternate/artificial sweeteners in preparation of drug dosage forms

6.4.2 Types of Alternate sweeteners used in Unani and other Conventional dosage forms

References: 238,241,242,243,244,245,246,247,259,260,396,397,398,399,400

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Discuss the role, significance, and necessity of alternate/artificial sweeteners in pharmaceutical dosage forms	1	Lecture	CC	Knows-how	L&PPT ,BS,EDU,L&GD
CO1,CO2	Identify and compare different types of alternate sweeteners used in Unani and conventional medicine based on their sources, sweetness intensity, and stability	2	Practical6.4	PSY-SET	Shows-how	W,JC,DIS,PT, DL
CO1,CO2	Evaluate the selection criteria for alternate sweeteners, analyzing their impact on patient compliance, formulation stability, and health considerations.	3	Experiential-Learning6.4	CAN	Does	BS,PT,PER,JC ,DIS

Unit 5 Surfactants and Emulsifying Agents عامل فعال سطحی عامل حلیب

6.5.1 Definition of Surfactants and Emulsifying Agents and their significance in preparation of drug dosage forms

6.5.2 Types of Surfactants and Emulsifying Agents used in Unani and other Conventional dosage forms

References: 237,238,239,241,242,243,244,245,246,259,261,262,264,265,266,267,268,269,272,273,275,276,277,396,397,398,399,400

3A	3B	3C	3D	3E	3F	3G
CO1	Define surfactants and emulsifying agents and describe their significance in the formulation of drug dosage forms	1	Lecture	CC	Knows-how	L&PPT ,BS,L&GD

CO1,CO2	Identify suitable Surfactant and Emulsifying Agents	2	Practical6.5	AFT-RES	Shows-how	LS,W,D,JC,PER
CO1,CO2	Categorize various types of surfactants and emulsifying agents used in Unani and conventional formulations based on their mechanism of action and applications	2	Experiential-Learning6.5	CAN	Does	BS,JC,PAL,DIS,D

Practical Training Activity

Practical Training 6.1 **Bases and Vehicles**

(Total duration of Activity: 2 hours)

1. The teacher will demonstrate the preparation of various formulations using different bases and vehicles and explain the step-by-step process of formulation, emphasizing the importance of uniform mixing, temperature control, and addition of excipients. (30 minutes)

2. Students will be given a group task or divided into multiple groups, with each group tasked with preparing a different formulation, such as ointment, cream, gel, or suspension. They will follow the teacher's demonstration and prepare the formulation by mixing the base with the drug and excipients. They will be encouraged to explore different ratios of base/vehicle and understand how the proportions affect the consistency, viscosity, and stability of the final formulation. They will evaluate the different types of bases and vehicles in terms of their functions in the formulations and further perform physical tests on their preparations. After preparing the formulations, students will participate in a group discussion where they will present their observations about the properties of the bases and vehicles they used.and will discuss the role of bases and vehicles in drug delivery, their impact on patient compliance, and the stability and efficacy of the formulation. (90 minutes)

Practical Training 6.2 **Permitted Colorants & Flavoring Agents**

(Total duration of Activity: 2 hours)

1. The teacher will demonstrate different colourants and flavouring agents commonly used in Unani and other Conventional systems indicating the different classes of colorants (e.g., natural vs. synthetic colorants) and permitted limits for use in pharmaceuticals. Also, guide students on safe preparation techniques, proper incorporation of flavorants to avoid instability or over-flavoring. (30 minutes - 1 hour) 2. Students will formulate different formulations such as syrups or suspensions using permitted colorants and flavoring agents and evaluate their impact on the appearance, taste, and stability or formulate chewable tablets or lozenges incorporating colorants and flavoring agents, and assess their appearance, taste, and solubility. (1 hour - 1 hour 30 minutes)
Practical Training 6.3 **Permitted Preservatives**
(Total duration of Activity: 2 hours) 1. The teacher will demonstrate different permitted preservatives commonly used in Unani and other Conventional systems and explain the types of preservatives, demonstrate the proper preparation techniques and explain how preservatives function to inhibit microbial growth. (30 minutes - 1 hour) 2. Students will preparation and evaluate a Liquid Formulation preferably *Sharbat*, with and without Preservatives. Prepare a *Sharbat* using sugar base. Incorporate a preservative (e.g., sodium benzoate) at a concentration that complies with pharmacopoeial standards. Divide the formulation into separate samples, one with preservative and another without preservatives. Test the pH and viscosity of the formulation to see if the preservatives alter the physical characteristics of the liquid. Perform microbial contamination testing to evaluate the effectiveness of preservatives. Analyze the results and discuss how the preservatives contribute to the safety and stability of the formulation. (1 hour - 1 hour 30 minutes)
Practical Training 6.4 **Alternate Sweeteners**
(Total duration of Activity: 2 hours) 1. The teacher will demonstrate different alternate sweeteners commonly used in Unani and other Conventional systems. Demonstrate the proper preparation of syrup formulations with alternate sweeteners and guide students in evaluating the taste and physical properties of the final product. Also discuss the regulatory guidelines for sweetener usage in pharmaceutical formulations. (30 minutes)

2. Students will formulate syrups using different alternate sweeteners (e.g., stevia, xylitol, sucralose) and evaluate their taste, physical stability, and sweetness equivalency compared to sugar. After preparation, they will evaluate the physical properties of different syrups, conduct taste tests and stability testing. Further discuss the impact of alternate sweeteners on formulation properties and their safety. (1 hour 30 minutes)

Practical Training 6.5 **Surfactants and Emulsifying Agents**

(Total duration of Activity: 2 hours)

1. The teacher will demonstrate different surfactants and emulsifying agents commonly used in Unani and other Conventional systems. Demonstrate the preparation of emulsions, emphasizing the importance of the emulsifying agent in achieving stability and guide students in evaluating the physical properties of emulsions and analyzing the results. (30 minutes)
2. Students will prepare an oil-in-water (O/W) or water-in-oil (W/O) emulsion using different emulsifying agents and evaluate the stability, particle size, and appearance of the formulations. They will be encouarged for group discussion to discuss the relationship between emulsifiers and the stability of emulsions. (1 hour 30 minutes)

Experiential Learning Activity

Experiential-Learning Learning 6.1: Bases and Vehicles

(Total duration of Activity: 3 hours)

1. Students shall be given individual/ group task to survey the market and collect samples of different pharmaceutical bases and vehicles and present a complete overview in a departmental seminar/ symposium (present one sample in case of individual and 3-5 samples in case of group). (3 hours)

OR

Students will perform a comparative study of Oil and Water-Based Vehicles for Topical Formulations to compare their performance in topical formulations like creams and ointments. Students will be divided in groups and prepare two formulations, one with an oil-based vehicle (e.g., mineral oil, lanolin) and one with a water-based vehicle (e.g., glycerin, water-based emulsifiers). Both formulations will contain the same drug to compare how the vehicle impacts the stability, viscosity, and spreadability. Students will perform a sensory evaluation on both formulations to assess their feel, odor, spreadability, and absorption properties

and discuss the differences in how oil-based vehicles may offer better emollient properties, while water-based vehicles may provide a cooling effect. This will give students practical experience in formulating and evaluating different types of pharmaceutical products. Students will gain hands-on skills in preparing topical formulations, testing their properties, and understanding the impact of bases and vehicles on drug solubility, stability, release, and patient compliance. (3 hours)

Experiential-Learning Learning 6.2: **Permitted Colorants & Flavoring Agents**

(Total duration of Activity: 3 hours)

1. Students shall be given individual/ group task to select and prepare any suitable classical dosage form and modify it using different colouring and/ or flavouring agents and present observations in class. (3 hours)

OR

1. Students will be divided in two groups to perform comparative study of Natural vs. Synthetic Colorants and Flavoring Agents in pharmaceutical formulations. Students will prepare any syrup, gel, or cream using natural and synthetic colorants and flavoring agents. They will then evaluate the stability, appearance, and taste (in case of oral formulation) of each formulation and discuss which formulations might be more acceptable for different populations (e.g., pediatric patients may prefer natural flavors). This will allow students to gain hands-on experience with the use of permitted colorants and flavoring agents in pharmaceutical formulations. By experimenting with different ingredients and evaluating their effects on appearance, taste, stability, and patient compliance, students will gain practical insights into the importance of these excipients in formulation design. (3 hours)

OR

1. Students will perform Stability Testing of Colorants and Flavoring Agents in Liquid Formulations to explore the stability over time and under different storage conditions. Students will prepare a liquid formulation (e.g., syrup, suspension, or elixir) using permitted colorants and flavoring agents. Store formulations under various conditions such as Room temperature, Refrigeration and Exposure to light. They will observe changes in the color, clarity, and taste of the formulations over a period of time (e.g., 1 week, 1 month) and also evaluate any precipitation or phase separation in the formulations. After the storage period, students will report on the stability of colorants and flavoring agents, identifying any degradation or fading of the color and flavor over time. (3 hours)

Note: Through these experiential learning activities, students will gain hands-on experience with permitted colorants and flavoring agents in pharmaceutical formulations. They will develop a deeper understanding of how color and flavor can affect a product's acceptability, stability, and effectiveness. By actively

engaging in formulation, evaluation, and stability testing, students will be better prepared to make informed decisions when selecting these excipients for their future pharmaceutical formulations.

Experiential-Learning Learning 6.3: **Permitted Preservatives**

(Total duration of Activity: 2 hours)

1. Students will be divided into two groups to perform comparative study of Natural vs. Synthetic Preservatives to enable students to compare the effectiveness and safety of natural preservatives (e.g., sugar, honey, etc.) versus synthetic preservatives (e.g., sodium benzoate, parabens) in pharmaceutical formulations. Students will prepare two sets of formulations (e.g., *sharbat*, *majoon*) with natural preservatives in one batch and synthetic preservatives in the other. The preservatives should be incorporated at their permitted concentrations, and students should be aware of the differences in preservative properties. Compare the effectiveness of natural vs. synthetic preservatives in preventing contamination. Students can conduct microbial contamination tests to evaluate the effectiveness of the preservatives. Discuss the advantages and disadvantages of each type of preservative in terms of safety, efficacy, and regulatory approval. (2 hours)

OR

1. Students shall be given individual/ group task to select and prepare any suitable classical dosage form and modify it using different permitted preservatives and present observations in class. (2 hours)

Experiential-Learning Learning 6.4: **Alternate Sweeteners**

(Total duration of Activity: 3 hours)

1. Students will be divided in groups and given an activity to formulate Sugar-Free Unani Beverages using various alternate sweeteners and evaluate their sensory properties (e.g., taste, mouthfeel) and stability. Students will formulate a variety of sugar-free beverages (e.g., syrups or fruit juices) using different alternate sweeteners. Each group will choose one or more sweeteners and add them to a beverage mix, ensuring the proper concentration to achieve a desired sweetness level. After formulation, students will taste-test the beverages and compare the sweetness, mouthfeel, and aftertaste of each formulation. Students will record feedback from a tasting panel (either peers or an instructor), paying attention to whether the sweetness is too strong, too weak, or if there is an aftertaste (a common issue with some sweeteners like stevia or aspartame). Discuss and test the stability of the beverages over time (e.g., changes in sweetness intensity, viscosity, or separation). Monitor the syrup's physical properties over a few days or weeks. Students will analyze the data and discuss how different sweeteners

impact the beverage's overall taste profile, stability, and customer preference. Also, discuss the advantages and disadvantages of using natural vs. synthetic sweeteners and consider the regulatory approval for each type of sweetener. (3 hours)

Experiential-Learning Learning 6.5: **Surfactants and Emulsifying Agents**

(Total duration of Activity: 2 hours)

1. Peer group discussion/ Brainstorming on exploration of different natural emulsifying agents used in Unani medicines. (2 hours)

OR

1. Students may be given individual topics for PowerPoint/ Journal Club presentation. (2 hours)

Modular Assessment

Assessment	**Hour**
The assessment will be for 25 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6 C. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks Or Problem-Based Assessments (25 marks) • Understanding the Problem - 5 Marks • Approach & Problem-Solving Skills - 10 Marks • Analysis & Justification- 5 Marks	2

- Presentation & Communication- 5 Marks

Or

Research report (25 marks)

- Conceptual Understanding - 5 Marks
- Research & Content - 10 Marks
- Critical Evaluation & Logical approach - 5 Marks
- References & Originality – 5 Marks

Or

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

Or

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

Semester No : 6

Module 7 : Integration of technological advancements in Unani Pharmaceutical Sciences یونانی دواسازی میں تکنیکی پیش رفت کاانضمام

Module Learning Objectives

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

1. Describe the scope and significance of technological advancements such as nanotechnology, bioinformatics, artificial intelligence (AI), and computational tools in Unani pharmaceutical sciences.
2. Apply knowledge of nanotechnology, bioinformatics databases, and AI tools to enhance research, drug formulation, and development in Unani pharmaceutics.
3. Evaluate the impact of emerging technologies on pharmaceutical processes, assessing their advantages, limitations, and potential future applications in Unani medicine.

Unit 1 Technological advancements in Unani Pharmaceutical Sciences علم الصیدلہ میں تکنیکی پیش رفت

7.1.1 Introduction and scope of technological advancements in Unani Pharmaceutical Sciences

References: 242,243,244,245,246,261,276,401,402,403,404,405,406,407

3A	3B	3C	3D	3E	3F	3G
CO1,CO2,CO6	Describe the scope, significance, and impact of technological advancements in Unani pharmaceutical sciences highlighting, key innovations and their roles.	1	Lecture	CC	Knows-how	L&PPT ,L&GD
CO2,CO6	Asses the impact of technological advancements on the efficiency, quality, and global competitiveness of Unani medicines, and evaluate future trends and challenges in this evolving field	2	Practical7.1	PSY-ADT	Shows-how	FC,DIS,PER

Unit 2 Nanotechnology in Unani Pharmaceutical Sciences علم الصیدلہ اور نینو ٹکنولوجی

7.2.1 Definition and role of Nanotechnology in Pharmaceutics

7.2.2 Scope & Application of Nanotechnology in Unani Pharmaceutical Sciences

References: 242,243,244,245,246,247,248,249,253,254,255,256,257,258,406,407

3A	3B	3C	3D	3E	3F	3G
CO2,CO6	Describe nanotechnology and its role in pharmaceutics, emphasizing its significance in drug formulation and delivery.	2	Lecture	CC	Knows-how	L&GD,L&PPT
CO2	Implement various nanotechnology-based approaches used in Unani pharmaceutical sciences, highlighting their applications in enhancing drug efficacy and bioavailability.	5	Practical7.2	PSY-ADT	Shows-how	D,FV,PT,W,PER

CO2	Assess and adapt Nanotechnology in Unani Pharmaceutical Sciences	6	Experiential-Learning7.1	PSY-ADT	Does	DIS,BS,PT,D,PL

Unit 3 Bioinformatics in Unani Pharmaceutical Sciences علم الصیدلہ اور بائیوانفارمیٹکس

7.3.1 Definition and role of Bioinformatics in Unani Pharmaceutical Sciences

7.3.2 Introduction of Major bioinformatics databases and resources: NCBI, GenBank, EMBL, and Expasy

References: 242,243,244,245,246,253,254,255,405

3A	3B	3C	3D	3E	3F	3G
CO2	Describe bioinformatics and its role in Unani pharmaceutical sciences, particularly in drug discovery, development, and standardisation.	3	Lecture	CC	Knows-how	L&GD,L&PPT
CO2	Identify and explore major bioinformatics databases such as NCBI, GenBank, EMBL, and Expasy, demonstrating their relevance in Unani medicine research.	5	Practical7.3	AFT-VAL	Shows-how	PER,JC,W,DIS
CO2	Analyze the impact of bioinformatics tools in enhancing the efficacy, safety, and quality control of Unani medicines, evaluating their potential for future advancements.	6	Experiential-Learning7.2	AFT-VAL	Does	D,JC,BS,PER,FV

Unit 4 Application of Computers in Unani Pharmaceutics یونانی دواسازی میں کمپیوٹرز کا اطلاق

7.4.1 Need of computers in Unani Pharmaceutics

7.4.2 Application of Computers in various aspects/areas of Unani Pharmaceutics

References: 242,243,244,245,246,275,276

3A	3B	3C	3D	3E	3F	3G

CO2	Desribe the need and significance of computers in Unani pharmaceutics, highlighting their role in research, formulation, and quality control.	2	Lecture	CC	Knows-how	L&PPT ,L&GD
CO2	Demonstrate the application of computer-based tools and software in various aspects of Unani pharmaceutics, such as data analysis, drug formulation, and documentation.	4	Practical7.4	PSY-ADT	Shows-how	PER,D,PT,FV, DIS
CO2	Evaluate the advantages and limitations of integrating computer technologies in Unani pharmaceutics, proposing strategies for enhancing efficiency and accuracy in drug development.	7	Experiential-Learning7.3	PSY-GUD	Does	FV,ML,DIS,JC, PER

Unit 5 Role of Artificial Intelligence (AI) in Unani Pharmaceutics علم الصیدلہ میں مصنوعی ذہانت کا کردار

7.5.1 Potential role of Artificial Intelligence (AI) in Unani Pharmaceutics, its advantages and limitations

References: 401,402,403,404

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the potential role of Artificial Intelligence (AI) in Unani Pharmaceutics	2	Lecture	CAP	Knows-how	L&PPT ,L&GD
CO2	Identify and analyze AI-driven tools and technologies used in Unani pharmaceutical sciences, demonstrating their advantages in research and development	4	Practical7.5	PSY-GUD	Shows-how	D,PT,DIS,PER
CO2	Evaluate the benefits and limitations of AI integration in Unani pharmaceutics, assessing its impact on efficiency, accuracy, and innovation in traditional medicine.	7	Experiential-Learning7.4	PSY-ADT	Does	DIS,JC,W,PER ,D

Practical Training Activity
Practical Training 7.1 Technological Advancements
(Total duration of Activity: 2 hours) 1. Teacher will appraise the need and scope of integration of technological advancements in Unani Pharmaceutical Sciences through power point/ videos. (1 hour) 2. Students will collect information on the effect of the technological advancements on the efficiency, quality, and global competitiveness of Unani medicines, and evaluate future trends and challenges in this evolving field. (1 hour)
Practical Training 7.2 **Application of Nanotechnology in Unani Pharmaceutical Sciences**
(Total duration of Activity: 5 hours) 1. The teacher will appraise the need and scope of integration of Nanotechnology in Unani Pharmaceutical Sciences through power point/ videos. (2 hours) 2. Students will explore and collect published information (scientific papers) on various nanotechnology-based approaches used in Unani pharmaceutical sciences, highlighting their applications in enhancing drug efficacy and bioavailability. They will be encouraged for peer group discussion and present their insights on the topic. (3 hours)
Practical Training 7.3 **Bioinformatics in Unani Pharmaceutical Sciences**
(Total duration of Activity: 5 hours) 1. The teacher will appraise the need and scope of integration of Bioinformatics in Unani Pharmaceutical Sciences through power point/ videos. (2 hours) 2. Students will explore the major bioinformatics databases such as NCBI, GenBank, EMBL, and Expasy, demonstrating their relevance in Unani medicine research. (3 hours)
Practical Training 7.4 **Computers in Unani Pharmaceutics**
(Total duration of Activity: 4 hours)

1. The teacher will appraise the need and scope of integration of Computers in Unani Pharmaceutical Sciences through live examples from Hospital or In-house Pharmacy or throuh power point/ videos. (1 hour) 2. Students will understand and explore about the application of computer-based tools and software in various aspects of Unani pharmaceutics, such as data entry, data analysis, drug store information, stock check, drug formulation, and documentation. (3 hours)
Practical Training 7.5 **Artificial Intelligence (AI) in Unani Pharmaceutics**
(Total duration of Activity: 4 hours) 1. The teacher will appraise the need and scope of integration of Artificial Intelligence (AI) in Unani Pharmaceutical Sciences through power point/ videos. (1 hour) 2. Students will identify and analyze AI-driven tools and technologies that can be used in Unani pharmaceutical sciences, demonstrating their advantages in research and development. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 7.1: **Application of Nanotechnology in Unani Pharmaceutical Sciences**
(Total duration of Activity: 6 hours) 1. Workshop/ Seminar/ Peer group discussion/ Brainstorming on application and importance of Nanotechnology in Unani medicine. (6 hours) OR 1. Meta analysis/ Power point/ Journal club presentation on application and importance of Nanotechnology in Unani medicine. (6 hours) OR 1. Market survey/ Field visit to explore the availability of new/ novel Unani products/ dosage forms based on Nanomedicine. (6 hours) OR 1. Visit to any Nanotechnology department to understand the need and application of Nanotechnology in Unani medicine. (6 hours)
Experiential-Learning Learning 7.2: **Bioinformatics in Unani Pharmaceutical Sciences**

(Total duration of Activity: 6 hours) 1. Visit to any Bioinformatics department to understand and explore the need and application of Bioinformatics in Unani medicine. (6 hours)
Experiential-Learning Learning 7.3: **Computers in Unani Pharmaceutics**
(Total duration of Activity: 7 hours) 1. Students will be given individual topics for PowerPoint/ Journal Club presentation. (7 hours) OR 1. Visit to any Pharmacy/ Pharmaceutical industry to analyse the scope and application of computers in Unani Pharmaceutics in large-scale set-ups. (7 hours)
Experiential-Learning Learning 7.4: **Artificial Intelligence (AI) in Unani Pharmaceutics**
(Total duration of Activity: 7 hours) 1. Workshop/ Seminar/ Peer group discussion/ Brainstorming on application and importance of Artificial Intelligence (AI) in Unani medicine. (7 hours) OR 1. Power point/ Journal club presentation on application and importance of Artificial Intelligence (AI) in Unani medicine. (7 hours) OR 1. Visit to any Artificial Intelligence (AI) department to gain first hand experience and understand the need and application of AI in Unani medicine. (7 hours)
Modular Assessment

Assessment	**Hour**
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 6 C. 1. Viva-25 marks 2. Lab-Based Assessments (Hands-on preparation and demonstration)- 25 marks	4

Or

1. SAQ: 5 questions -20 marks

2. Project work -30 marks

Or

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

and

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

Module 8 : Packaging Material & Production Management in Unani Pharmaceutics (یونانی دواسازی میں پیکیجنگ میٹیریل اور تنظیم صنعت)

Module Learning Objectives

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

1. Describe the significance, classification, and selection criteria of packaging materials such as glass, plastics, rubbers, metals, and paper in Unani pharmaceutics.
2. Apply the knowledge of pharmaceutical packaging advancements to examine recent trends, innovations, and their impact on drug stability and safety.
3. Assess essential components of production management, including influencing factors, pharmaceutical manufacturing facilities, and strategies for process optimization.

Unit 1 Packaging Material پیکیجنگ میٹیریل

8.1.1 Introduction & importance of Packaging Material

References: 242,243,244,245,246,256,261,262,276,408,409,410,411,412

3A	3B	3C	3D	3E	3F	3G
CO2	Describe the importance of packaging materials in pharmaceuticals, particularly in preserving the efficacy and stability of Unani medicines.	1	Lecture	CC	Knows-how	L&GD,L&PPT

CO2,CO6	Demonstrate different types of packaging materials used in Unani pharmaceutics, assessing their suitability for various dosage forms	2	Practical8.1	PSY-GUD	Shows-how	DIS,JC,PER,PT

Unit 2 Types of Packaging پیکیجنگ کی اقسام

8.2.1 Primary, Secondary & Tertiary packaging

References: 242,243,244,245,246,256,261,262,276,408,409,410,411,412

3A	3B	3C	3D	3E	3F	3G
CO2,CO6	Describe and differentiate between primary, secondary, and tertiary packaging in pharmaceuticals, emphasizing their roles in Unani medicine	2	Lecture	CAP	Knows-how	L&GD,L&PPT
CO2	Demonstrate Primary, Secondary & Tertiary packaging in packing different classes of Unani medicine	2	Practical8.2	PSY-ADT	Shows-how	DIS,PT,JC,TBL,PER
CO2,CO6	Assess Primary, Secondary & Tertiary types of packaging in factory setting	4	Experiential-Learning8.1	AFT-VAL	Does	PER,FV,DIS

Unit 3 Packaging materials used in pharmaceutics دواسازی میں مستعمل پیکیجنگ میٹیریل

8.3.1 Different materials used for packaging-Glass, Plastics, Rubbers, Metal, Paper, Other materials

8.3.2 Factors affecting the selection of appropriate material

References: 242,243,244,245,246,256,261,262,276,408,409,410,411,412

3A	3B	3C	3D	3E	3F	3G
CO2,CO6	Discuss factors affecting the selection of appropriate material for packaging	2	Lecture	CC	Knows-how	L&PPT ,L&GD
CO2,CO6	Demonstrate use of different materials such as Glass, Plastics, Rubbers Metal, Paper and other materials in packaging	4	Practical8.3	PSY-GUD	Shows-how	JC,FV,PER,DIS

CO2,CO6	Document and Compare different materials used for packaging in Unani Pharmaceutics.	6	Experiential-Learning8.2	PSY-GUD	Does	FV,PER,W,JC,DIS
Unit 4 Pharmaceutical advancements in packaging دواؤں کی پیکیجنگ میں ہونے والی پیش رفت 8.4.1 Scope of Pharmaceutical advancements in packaging 8.4.2 Recent trends and future of pharmaceutical packaging and packing materials **References:** 242,243,244,245,246,261,262,276,408,409,410,411,412						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO2,CO6	Describe the evolution of pharmaceutical packaging and its significance in ensuring drug efficacy, safety, and regulatory compliance	2	Lecture	CAP	Knows-how	L&GD,L&PPT
CO2,CO6	Compare and apply traditional and modern packaging technologies, assessing their advantages and limitations in Unani pharmaceutics	4	Practical8.4	PSY-ADT	Shows-how	SDL,DIS,PT,JC
CO2,CO6	Investigate case studies on innovative packaging solutions, proposing improvements for sustainable, cost-effective, and patient-friendly packaging.	6	Experiential-Learning8.3	AFT-REC	Does	PER,FV,SDL,DIS,JC
Unit 5 Production management تنظیم دواسازی 8.5.1 Introduction & importance 8.5.2 Factors affecting production management 8.5.3 Pharmaceutical Manufacturing Facilities **References:** 242,243,244,245,246,247,248,249,250,261,262,276						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**

CO2,CO6	Describe the concept and significance of production management in Unani pharmaceutics, including its role in ensuring efficiency and quality.	3	Lecture	CC	Knows-how	L&GD,L&PPT
CO2,CO6	Participate and Examine industry practices to identify the key factors influencing effective production management in Unani pharmaceutics	8	Practical8.5	PSY-GUD	Shows-how	PER,PT,FV,DIS
CO2,CO6	Develop a strategic plan for improving production efficiency, addressing challenges like resource utilization, waste reduction, and process optimization.	10	Experiential-Learning8.4	AFT-VAL	Does	D,DIS,PER,FV

Practical Training Activity

Practical Training 8.1 **Packaging Material**

(Total duration of Activity: 2 hours)

1. The teacher will demonstrate and appraise the need and scope of advancement in packaging material science in Unani Pharmaceutics through live examples or power point/ videos. (1 hour)

2. Students will be encouraged for Group discussion to enlist different types of packaging materials used in Unani pharmaceutics, assessing their suitability for various dosage forms. (1 hour)

Practical Training 8.2 **Types of Packaging.**

(Total duration of Activity: 2 hours)

1. The teacher will demonstrate with examples the different types of packaging. (1 hour)

2. The students will observe and identify various types of packaging and their specific uses in pharmaceutical formulations. They will be encouraged to ask questions to better understand the practical applications of packaging materials in relation to the dosage forms they are designed to contain. (1 hour)

Practical Training 8.3 Materials in Packaging

(Total duration of Activity: 4 hours) 1. The teacher will demonstrate with examples the different types of materials used for packaging and encourage students to think critically about packaging materials and how they influence the efficacy and safety of drug products. (1 hour) 2. The students will be encouraged for group discussion to consolidate the knowledge of packaging materials and their relevance in ensuring the safety, efficacy, and stability of Unani pharmaceutical products. The students reflect on the importance of packaging and how it affects the pharmaceutical product lifecycle. Further, discuss regulatory considerations and the impact of packaging on product development, stability, storage, and patient compliance. (3 hours)
Practical Training 8.4 Advancements in packaging
(Total duration of Activity: 4 hours) 1. The teacher will appraise the need and scope of advancement in packaging in Unani Pharmaceutics through power point/ videos. (1 hour) 2. Students will conduct a group discussion to compare and contrast traditional and modern packaging technologies, assessing their advantages and limitations in Unani pharmaceutics. (3 hours)
Practical Training 8.5 Production Management
(Total duration of Activity: 8 hours) 1. Teacher will conduct live demonstration of different aspects involved in production management in attached Hospital Pharmacy/ Teaching Pharmacy. (3 hours) 2. Students will participate and examine hospital pharmacy practices to identify the key factors influencing effective production management in Unani pharmaceutics. (5 hours)
Experiential Learning Activity
Experiential-Learning Learning 8.1: Types of Packaging
(Total duration of Activity: 4 hours)

1. Market survey/ Field visit to explore the availability of different types of packaging used in Unani products/ dosage forms and assess the scope of advancement. (4 hours)
Experiential-Learning Learning 8.2: Packaging in Unani Pharmaceutics
(Total duration of Activity: 6 hours) 1. The students will perform study of different packaging materials to familiarize with different types of pharmaceutical packaging materials and their uses for specific dosage forms. The students arrange samples of various packaging materials (glass vials, plastic bottles, aluminum tubes, blister packs) and examine and compare the properties of each packaging material likeTransparency (whether the material allows light to pass through), Strength (e.g., glass vs. plastic), Moisture resistance (using a moisture meter if available), Inertness (whether the material reacts with the drug product or not), Ease of use (e.g., ease of opening or dispensing). Discuss about the suitability of different packaging materials for different types of pharmaceutical products and evaluate the pros and cons of each packaging material for specific types of pharmaceutical products. Engage in group discussions about the impact of packaging on drug product stability and safety. (6 hours) OR 1. Market survey/ Field visit to explore the usage of different types of packaging materials in Unani products/ dosage forms and assess the scope of advancement. (6 hours)
Experiential-Learning Learning 8.3: Advancements in packaging
(Total duration of Activity: 6 hours) 1. Students will be given individual topics for PowerPoint/ Journal Club presentation/ Peer group discussion. (6 hours)
Experiential-Learning Learning 8.4: Pharmaceutical Manufacturing Facilitie
(Total duration of Activity: 10 hours) 1. Visit to a GMP certified Unani Pharmaceutical Company to understand and observe the different factors and steps/ phases involved in production management. (10 hours)

Modular Assessment	
Assessment	**Hour**
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 6 C. 1. Viva-25 marks 2. Project work -25 marks Or 1. SAQ: 5 questions -25 marks 2. Problem based Assessment: 25 marks Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Paper No : 2(STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)

Semester No : 3

Module 9 : Quality Assurance, Standardisation and Good Practices in Unani Drugs یونانی ادویہ کی ضمانت اوصاف، معیار بندی اور صنعت جیدہ

Module Learning Objectives

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

1 Describe the various factors and role good practices that affects the quality of drugs and primary steps to be taken for improving the quality, safety and efficacy of drugs

2 Conduct differential analysis on monographs of herbs reported in various national and international pharmacopoeias.

3 Identify the nature of adulteration and type of adulterant in a given sample of a drug.

Unit 1 Quality Assurance, Quality Control and Standardisation ضمانت اوصاف، ضبط اوصاف اور معیار بندی

9.1.1 Introduction to Quality Assurance, Quality Control and Standardisation

9.1.2 Factors Affecting the Quality of Unani Drugs

9.1.2.1 Extrinsic Factors

9.1.2.2 Intrinsic Factors

References: 184,185,188,195

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	**Describe the terms Quality Assurance, Quality Control and Standardisation in relation to Unani drugs.**	2	Lecture	CC	Knows-how	L&PPT ,L&GD
CO4,CO5, CO7	**Discuss the extrinsic and intrinsic factors that affect the quality of Unani drugs**	2	Practical9.1	CAN	Shows-how	DIS,TPW,PrBL,PL,BS

CO4,CO5, CO7	**Document the factors that affect the quality of Unani drugs**	4	Experiential-Learning9.1	AFT-CHR	Does	SDL,PT,PER,DIS,JC

Unit 2 Adulteration in Unani drugs یونانی ادویہ میں آمیزش

9.2.1 Adulteration

9.2.1.1 Purpose of adulteration

9.2.1.2 Modes of adulteration

9.2.1.3 Types of adulteration

9.2.1.4 Deliberate adulteration

9.2.1.5 In-deliberate adulteration

9.2.2 Substitute of drugs their principle and ethics

References: 2,5,183,184,185,200

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7,CO8	**Describe adulteration in Unani drugs**	2	Lecture	CC	Knows-how	FC,L&GD,L&PPT
CO4,CO5, CO7,CO8	**Enlist and document the types and modes of adulteration in Unani drugs**	4	Practical9.2	PSY-SET	Shows-how	DIS,PAL,DL,PT
CO4,CO5, CO7	**Demonstrate deliberate and accidental adulteration in Unani drugs**	4	Practical9.3	PSY-ADT	Shows-how	PER,IBL,DIS,PT,D
CO1,CO4, CO5,CO7	**Analyse ethical substitution of drugs as per classical Unani literature.**	4	Experiential-Learning9.2	AFT-CHR	Does	TPW,BS,DIS,PL,IBL

Unit 3 Pre-requisites and primary steps for the quality, safety and efficacy of herbal medicines ادویہ کے معیاری، محفوظ اور مؤثر ہونے کے لئے درکار اقتضاء اساسی اور ابتدائی اقدامات

9.3.1 Pre-requisites and primary steps for the quality, safety and efficacy of herbal medicines

9.3.1.1 Good Agriculture Practices (GAP)

9.3.1.2 Good Collection Practices (GCP)

9.3.1.3 Good Harvesting Practices (GHP)

9.3.1.4 Good Post-harvesting Practices (GPHP)

9.3.1.5 Good Storage Practices (GSP)

9.3.1.6 Good Laboratory Practices (GLP)

9.3.1.7 Good Manufacturing Practices (GMP)

9.3.1.8 Standard Operating Procedures (SOP)

9.3.2 Macroscopic characterization of crude material as per classical Unani literature and pharmacopoeia.

9.3.3 Botanical Reference Standards (BRS)

References: 176,189,190,195,200

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	**Enlist & Describe various good practices viz.Good Agriculture Practices (GAP), Good Collection Practices (GCP), Good Harvesting Practices (GHP), Good Post-harvesting Practices (GPHP), Good Storage Practices (GSP), Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP)**	1	Lecture	CC	Knows-how	L&GD,L_VC,L&PPT
CO4,CO5	**Apply the knowledge of SOP and DNA barcoding in the standardisation of Unani drugs**	1	Lecture	CAP	Knows-how	DIS,PER,FC,L_VC

CO4,CO5, CO8	**Compare & identify the macroscopic characterization of crude material as per classical Unani literature and pharmacopeia.**	4	Practical9.4	CAP	Shows-how	BS,D,DIS,PrBL,DL
CO4,CO5, CO7	**Develop Botanical Reference Standards (BRS) of Unani drugs**	6	Experiential-Learning9.3	CS	Does	DIS,LS,FV,PrBL,BL

Unit 4 Aims and objectives of standardisation of Unani drugs یونانی ادویہ کی معیار بندی کے مقاصد اور اہداف

9.4.1 Aims and objectives of standardisation of Unani drugs

9.4.1.1 Identification of botanical source

9.4.1.2 Identification of Adulterants

9.4.1.3 Identify the quality of crude drugs cultivated at different localities

9.4.1.4 Determination of suitable time of harvest

9.4.2 An Overview of parameters of drug standardisation and quality control

9.4.2.1 Identification

9.4.2.2 Purity

9.4.2.3 Quantitative analysis or assay

References: 2,175,176,195,197

3A	3B	3C	3D	3E	3F	3G
CO5,CO7, CO8	**Identify the botanical source, Adulterants and the quality of crude drugs cultivated at different localities**	2	Lecture	CC	Knows-how	L&GD,BS,L&PPT

CO5,CO7, CO8	**Determine the suitable time of harvesting of Unani drugs**	2	Practical9.5	CS	Shows-how	PrBL,DIS,TBL,LS,BS
CO4,CO5, CO7,CO8	Assess various parameters of drug standardisation and quality control	6	Experiential-Learning9.4	CAN	Does	TBL,BS,IBL,DIS

Unit 5 Overview of Pharmacopeial Monographs فارماکوپیئل مونو گراف کا جائزہ

9.5.1 Overview of Monographs

9.5.1.1 Pharmacopeial Monographs of Unani Pharmacopoeia of India (UPI), Ayurvedic Pharmacopoeia of India (API), United States of Pharmacopoeia (USP), European Pharmacopoeia (Ph. Eur.), Indian Pharmacopoeia (IP) and British Pharmacopoeia (BP)

9.5.1.2 Monographs of World Health Organisation (WHO), European Scientific Cooperative on Phytotherapy ESCOP and Indian Council of Medical Research (ICMR)

References: 176,177,178,179,180,182

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	**Describe Pharmacopeial Monographs of herbal drugs mentioned in various pharmacopeia viz. UPI, API, USP, EP, IP and BP**	2	Lecture	CC	Knows-how	L&PPT ,L_VC,L&GD
CO4,CO5, CO7	**Compare monographs of drugs in different pharmacopeia with UPI**	2	Practical9.6	CAN	Shows-how	PER,PrBL,DIS,BS
CO4,CO5, CO7	**Differentiate between the monographs of WHO, ESCOP and ICMR**	2	Practical9.7	AFT-VAL	Shows-how	TBL,PL,IBL

CO4,CO5, CO7	**Analyse and critically evaluate the monograph of a Unani Drug present in different Pharmacopoeias**	6	Experiential-Learning9.5	CS	Does	DIS,BS

Practical Training Activity

Practical Training 9.1 **Extrinsic and intrinsic factors that affect the quality of Unani drugs**

(Total Duration of Activity: 2 hours)

1. The teacher will guide students in identifying extrinsic (storage conditions, adulteration, environmental factors) and intrinsic (genetic, chemical composition, harvesting time) factors affecting Unani drugs. They will facilitate discussions and provide reference materials for in-depth understanding. (1 hour)
2. Students will work in groups to research different factors affecting Unani drug quality, using classical texts and modern studies. They will collect examples of deteriorated drugs and compare them with high-quality samples. After gathering information, they will create a comparative chart highlighting the impact of these factors on drug efficacy and safety. Each group will present their findings, followed by a discussion moderated by the teacher (1 hour for discussion and presentations).

Practical Training 9.2 **Types and modes of adulteration in Unani drugs**

(Total duration of Activity: 4 hours)

1. The teacher will guide students in understanding the different types and modes of adulteration in Unani drugs by providing case studies and regulatory perspectives. They will also facilitate discussions on the impact of adulteration and introduce analytical methods for detection. (1 hour)
2. Students will work in small groups to research examples of adulteration in Unani drugs using classical texts and modern case reports. Each group will prepare a presentation covering types, methods, and effects of adulteration, along with possible detection techniques. They will enlist 10 different drugs (impure and pure) in their presentation. They will then present their findings, followed by a discussion and demonstration of simple detection tests for common adulterants. (2 hours)
3. Finally, the class will engage in comparative analysis, summarizing key learnings and preventive measures against adulteration. (1 hour)

Practical Training 9.3 **Deliberate and accidental adulteration in Unani drugs**

(Total Duration of Activity: 4 hours)

1. The teacher will guide students in understanding the concept of deliberate and accidental adulteration in Unani drugs by providing examples and explaining the impact on efficacy and safety. They will assist students in identifying reference books, pharmacopeias, and online resources for research. (1 hour)

2. Students will work in groups to search for real-life cases of adulteration in Unani drugs, referring to classical texts and modern research. Each group will analyze the type, cause, and detection methods of adulteration and prepare a report. They will then present their findings, demonstrating adulteration detection techniques through visual aids or practical tests such as microscopy or solubility tests. (2 hours)

3. The session will conclude with a discussion moderated by the teacher, summarizing key learnings and addressing queries. (1 hour)

Practical Training 9.4 **Macroscopic characterization of crude material as per classical Unani literature and pharmacopeia.**

(Total Duration of Activity: 4 hours)

1. The teacher will guide students in selecting ten crude drugs and provide references from classical Unani literature and the Unani Pharmacopoeia of India. They will oversee students' research, ensuring they analyze macroscopic characteristics such as color, texture, odor, taste, shape, and size. The teacher will also facilitate discussions on variations between classical descriptions and pharmacopeial standards. (1 hour)

2. Students will individually research their assigned drugs, documenting macroscopic characteristics from both sources. They will capture high-quality images or sketches of crude materials for comparison. Each student will then prepare and deliver a PowerPoint presentation highlighting similarities and differences in macroscopic features. The session will conclude with an interactive discussion where students critically analyze and justify variations in descriptions based on historical and contemporary perspectives. (2 hours presentation + 1 hour discussion)

Practical Training 9.5 **Suitable time of harvesting of Unani drugs**

(Total Duration of Activity: 2 hours)

1. The teacher will guide students in understanding the significance of the appropriate harvesting time for Unani drugs by providing key references and explaining classical principles. They will supervise students’ exploration of both traditional and contemporary sources to ensure a comprehensive understanding. (30 minutes)

Students will be divided into two groups to collect and compare classical Unani texts with recent scientific studies on the optimal harvesting time of selected medicinal plants. After reviewing the literature, each group will then submit a brief report. (1.5 hours)
Practical Training 9.6 **Compare monographs of drugs in different pharmacopoeia with UPI**
(Total Duration of Activity: 2 hours) 1. Teachers will guide students in selecting five drugs from the Unani Pharmacopoeia of India (UPI) and provide access to different pharmacopoeias such as the Ayurvedic Pharmacopoeia of India (API) and Siddha Pharmacopoeia of India (SPI). They will ensure students understand key monograph parameters like identification, purity, strength, and formulation standards. (30 minutes) 2. Students will analyze and compare monographs of assigned drugs, noting variations in definitions, testing methods, and specifications across pharmacopoeias. They will compile findings, highlighting differences and potential implications for Unani pharmacy, followed by an interactive discussion facilitated by teachers to deepen understanding. (1.5 hours)
Practical Training 9.7 **Differentiate between the monographs of WHO, ESCOP and ICMR**
(Total Duration of Activity: 2 hours) 1. The teacher will introduce the significance of monographs by WHO, ESCOP, and ICMR, highlighting their role in standardisation and quality assurance of herbal medicines. They will guide students on key aspects to compare, such as methodology, scope, and regulatory influence, before facilitating group-based analysis. (30 minutes) 2. Students will work in small groups to examine monographs from each organization, identifying similarities and differences in parameters like composition, indications, safety profiles, and references. Peer discussion to critically evaluate variations in approach and regulatory impact. The session will conclude with a teacher-led synthesis of key points. (1.5 hours)
Experiential Learning Activity
Experiential-Learning Learning 9.1: **Factors that affect the quality of Unani drugs**

(Total Duration of Activity: 4 hours)

1. Students will individually analyze the factors affecting the quality of Unani drugs by reviewing classical texts, modern research articles, and pharmacopoeial standards (1 hour).

2. They will observe market samples of selected crude drugs, compare variations in color, texture, and aroma, and document possible reasons for differences, such as geographical source, harvesting time, or storage conditions (1 hour).

3. Based on their findings, they will create a chart categorizing factors into intrinsic (genetic, seasonal) and extrinsic (processing, storage) influences. Each student will submit their chart along with a brief reflection on how these factors impact the efficacy and safety of Unani formulations (2 hours).

Experiential-Learning Learning 9.2: Ethical substitution of drugs as per classical Unani literature

(Total duration of Activity: 4 hours)

1. The teacher will instruct students to collect classical Unani literature on ethical substitution (Abdal Advia) and study the principles behind substituting unavailable drugs. In the first hour, students will review classical texts and identify five drugs that are no longer available. (1 hour)

2. The next one hour will be spent analyzing the reasons for their unavailability, such as ecological changes or overharvesting.(1 hour)

3. In the following one hour, students will suggest possible substitutions based on classical Unani principles and justify them with textual references.(1 hour)

4. In the final hour, students will correlate their suggested substitutes with modern scientific literature and document their findings in their logbooks.(1 hour)

Experiential-Learning Learning 9.3: **Botanical Reference Standards (BRS) of Unani drugs**

(Total Duration of Activity: 6 hours)

1. Students will spend the first hour researching Botanical Reference Standards (BRS) of Unani drugs through online sources, focusing on their significance in standardisation and quality control. In the next two hours, they will visit PCIM&H or a local laboratory, institute, museum housing or online database of BRS to observe their collection, documentation, and authentication process. (1 hour)

2. The following two hours will be dedicated to interacting with experts to understand the development and maintenance of BRS. (2 hours)

3. In the last three hours, students will compile their observations into a structured report, reflecting on their experiential learning and submitting it as per the teacher's instructions. (3 hours)

Experiential-Learning Learning 9.4: Parameters of drug standardisation and quality control
(Total Duration of Activity: 6 hours) 1. In the first hour, students will explore official pharmacopoeias and standardisation guidelines to identify key parameters for drug quality control. (1 hour) 2. In the second hour, they will analyze various parameters such as physicochemical, microbiological, and phytochemical aspects through literature and case studies. (1 hour) 3. The third hour will focus on comparing regulatory standards of Unani, Ayurvedic, and modern pharmacopoeias. (1 hour) 4. In the fourth hour, students will critically assess research articles on standardisation techniques. (1 hour) 5. The fifth hour will be dedicated to documenting their findings systematically.(1 hour) 6. In the final hour, they will present their compiled list and reflect on its significance in ensuring drug safety and efficacy. (1 hour)
Experiential-Learning Learning 9.5: **Monograph of a Unani Drug**
(Total Duration of Activity: 6 hours) 1. Each student will select a Unani drug and critically analyze its monograph in the Unani Pharmacopoeia of India (UPI) and one other recognized pharmacopoeia. In the first hour, students will independently study and compare the definitions, descriptions, standards, and formulations in both pharmacopoeias.(1 hour) 2. The second and third hours will be dedicated to identifying variations in quality parameters and therapeutic indications.(2 hours) 3. In the fourth hour, students will evaluate the scientific rationale behind these differences.(1 hour) 4. In the fifth hour, they will prepare a structured PowerPoint presentation summarizing their findings.(1 hour) 5. The final hour will be used for individual presentations, where each student will justify their critical evaluation and engage in discussions with peers and faculty.(1 hour)
Modular Assessment

Assessment	**Hour**

Instructions- 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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Project work – (20 Marks) • Research & Content -10 Marks • Presentation & Creativity -5 Marks • Viva Voce & Explanation - 5 Marks Or Any practical in converted form can be taken for assessment. (25 Marks)	4

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

Module 10 : Extraction of Herbal Drugs تعصیر ادویہ

Module Learning Objectives

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

1 Describe the Theory of drug extraction Factors affecting the choice of an extraction process

2 Prepare out extraction of Unani drugs using different types of solvents and methods of extraction.

3 Evaluate the extractive values of Unani drugs as per UPI

Unit 1 Introduction and importance of extraction in drug analysis ادویہ کے تجزیہ میں عمل تعصیر کا تعارف اور اہمیت

10.1.1 Introduction and importance of extraction in drug analysis

10.1.1.1 Theory of drug extraction

10.1.1.2 Factors affecting the choice of an extraction process

References: 189,196,200

3A	3B	3C	3D	3E	3F	3G
CO5,CO6	Discuss the various methods of extraction and list the various factors affecting the choice of an extraction process.	2	Lecture	CC	Knows-how	PER,L&PPT ,L&GD

Unit 2 Solvents used for extracting drugs and their properties عمل تعصیر میں مستعمل محللات اور ان کی خصوصیات

10.2.1 Solvents used for extracting drugs and their properties

References: 196,200

3A	3B	3C	3D	3E	3F	3G
CO5	Describe the properties of various solvents used for extracting Unani drugs	1	Lecture	CC	Knows-how	PER,L&PPT ,DIS,L
CO5,CO6	Identify and compare different solvents used in extraction	2	Practical10.1	PSY-GUD	Shows-how	FC,PT,PER,D,DIS
CO5,CO6	Identify the suitable solvent for extracting Unani drugs depending upon the nature of the component to be extracted	4	Experiential-Learning10.1	CAP	Does	D,PER,PT,DIS

Unit 3 Methods of extraction عمل تعصیر کے طریقے

10.3.1 Methods of extraction

References: 176,196,200

3A	3B	3C	3D	3E	3F	3G
CO5,CO6	Describe the various methods of extraction	2	Lecture	CC	Knows-how	PL,L&PPT ,L&GD,DIS
CO5,CO6	Identify the suitable method of extraction depending on the nature of the drug	8	Practical10.2	CAP	Shows-how	PER,D,DL,DIS
CO5,CO6	Prepare extracts of Unani drugs using different methods of extraction	8	Experiential-Learning10.2	PSY-MEC	Does	PBL,DL,PT,DIS

Unit 4 Extraction of volatile and fixed oils روغن فراری اور روغن کثیف کشید کرنے کے طریقے

10.4.1 Extraction of volatile and fixed oils

References: 176,196

3A	3B	3C	3D	3E	3F	3G
CO5,CO6	Describe the methods of extracting volatile and fixed oils.	2	Lecture	CC	Knows-how	L&GD,DIS,L&PPT
CO5,CO6, CO7	Demonstrate the separation of fixed and volatile oils from the oils containing Unani drugs	6	Practical10.3	CAN	Shows-how	PER,DIS,DL
CO5,CO6, CO7	Analyse the given sample for fixed and volatile oil	8	Experiential-Learning10.3	PSY-GUD	Does	DL,DIS,PER

Unit 5 Determination of extractives in specific solvents مخصوص محللات میں مقدار تعصیر کا تعین

10.5.1 Determination of extractives in specific solvents

10.5.1.1 Non-volatile Ether soluble Extractive

10.5.1.2 Volatile Ether soluble Extractive

10.5.1.3 Solvent Hexane soluble Extractives

10.5.2 Determination of extractable matter as per Unani Pharmacopoeia

10.5.2.1 Determination of Alcohol-soluble Extractive

10.5.2.2 Determination of Water soluble Extractives

10.5.2.3 Successive solvent extraction

References: 176,177,178

3A	3B	3C	3D	3E	3F	3G

CO5,CO6	Describe the Non-volatile Ether soluble Extractive, Volatile Ether soluble Extractive, Solvent Hexane soluble Extractives, Alcohol-soluble Extractive, Water soluble Extractives and Successive solvent extraction	2	Lecture	CC	Knows-how	L&GD,L&PPT ,DIS,FC
CO5,CO6	Determine Alcohol-soluble Extractive, Water soluble Extractives and Successive solvent extraction	4	Practical10.4	PSY-ADT	Shows-how	DL,D,PT,DIS,BL
CO5,CO6	Calculate the Non-volatile Ether soluble extractive value, Volatile Ether soluble extractive value, Solvent Hexane soluble extractive value, Alcohol-soluble extractive value, and Water soluble extractive value	6	Experiential-Learning10.4	PSY-ADT	Does	DIS,DL,D

Unit 6 Advanced extraction techniques عمل تعصیر کے جدید طریقے

10.6.1Advanced extraction techniques

10.6.1.1 Supercritical fluid extraction

10.6.1.2 Microwave-assisted extraction

10.6.1.3 Ultrasound-assisted extraction

References: 196

3A	3B	3C	3D	3E	3F	3G
CO5,CO6	Describe the advanced extraction techniques viz. Supercritical fluid extraction, Microwave-assisted extraction, Ultrasound-assisted extraction	1	Lecture	CC	Knows-how	L&PPT ,L&GD

Practical Training Activity

Practical Training 10.1 **Different solvents used in the extraction**

(Total Duration of Activity: 2 hours) 1. The teacher will begin by demonstrating the extraction process using both water and alcohol as solvents, explaining their varying efficiencies in extracting active constituents. They will highlight key factors such as temperature, solubility, and polarity, ensuring students understand the theoretical basis before performing the experiment themselves. (30 minutes) 2. Students will select a crude drug, weigh an appropriate quantity, and divide it into two portions. They will then perform reflux extraction separately with water and alcohol, carefully noting differences in color, odor, and yield of the extracts. After filtration, they will compare the extracts and discuss which solvent was more effective for the selected drug, justifying their observations based on solubility principles. (1.5 hours)
Practical Training 10.2 Suitable method of extraction depending on the nature of the drug.
(Total Duration of Activity: 8 hours) 1. The teacher will first demonstrate various extraction methods such as decoction, infusion, maceration, percolation, and Soxhlet extraction, explaining how the choice of method depends on the drug's nature—whether it is heat-sensitive, volatile, or requires prolonged extraction. The teacher will also highlight factors like solvent selection, temperature, and duration, ensuring students understand the theoretical basis before hands-on practice. (2 hours) 2. Students will work in small groups, each assigned a different extraction method based on the type of crude drug provided. They will independently conduct the extraction process, carefully documenting parameters like time, temperature, and yield. Each group will compare results to determine the most efficient method for their assigned drug. Observations will be recorded in lab notebooks, and at the end, students will present their findings, discussing challenges and optimization techniques. The session will conclude with a group discussion, where students analyze which method is most suitable for specific drug types and justify their choices based on scientific principles. (6 hours)
Practical Training 10.3 Fixed and volatile oils from the oils containing Unani drugs
(Total Duration of Activity: 6 hours) 1. The teacher will begin by explaining the principles of oil extraction, highlighting the differences between fixed and volatile oils in Unani drugs. They will demonstrate the setup of Soxhlet extraction for fixed oils and hydro-distillation for volatile oils, ensuring students understand safety protocols and key extraction

parameters. Throughout the session, the teacher will supervise, guide, and troubleshoot while encouraging students to take the lead in conducting the practical. (1 hour) 2. Students will work in small groups to extract fixed oil from any unani drug like Roghan Badam (Almond oil) using Soxhlet extraction with petroleum ether. Simultaneously, another group will extract volatile oil from any unani drug like Zanjabeel (Ginger) using hydro-distillation. They will weigh the drug material, set up and operate the apparatus, and carefully monitor temperature and solvent use. After extraction, students will separate, filter, and measure the yield of the oils, recording their observations on color, odor, and solubility. They will also perform basic qualitative tests such as the saponification test for fixed oils and the odor test for volatile oils. Finally, each group will present their findings, comparing their results with Unani classical references. (5 hours)
Practical Training 10.4 Alcohol and Water soluble Extractive value of the given drug and Successive Extraction
(Total Duration of Activity: 4 hours) 1. The teacher will demonstrate the standard procedure for determining alcohol and water-soluble extractive values, explaining the significance of each step. They will guide students in selecting appropriate solvents, maintaining extraction conditions, and ensuring accuracy in measurements. (1 hour) 2. Students will independently perform successive extraction using increasing polarity solvents, beginning with petroleum ether, followed by alcohol and water. They will weigh the dried extracts, calculate extractive values, and compare them to reference standards. Observations will be recorded, and students will discuss variations in extractive values based on solubility principles. A brief presentation of findings will conclude the session. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 10.1: Eextract the sample of a drug using different solvents
(Total Duration of Activity: 4 hours) 1. Each student will be provided with a sample drug and instructed to determine the most suitable solvent for extraction based on the nature of its main constituents. In the first hour, students will conduct a literature review to understand the solubility of different phytochemicals in various solvents.(1 hour) 2. In the second hour, they will classify their assigned drug's main components and predict the best solvent based on polarity and solubility principles.(1 hour) 3. The third hour will be spent selecting and justifying the choice of solvents through theoretical reasoning.(1 hour)

4. In the final hour, students will document their findings reflecting on their decision-making process.(1 hour)
Experiential-Learning Learning 10.2: Extracts of Unani drugs using different methods of extraction
(Total Duration of Activity: 8 hours) 1. The teacher will divide students into groups, assigning each group a specific extraction method such as maceration, percolation, Soxhlet extraction, decoction, or hydro-distillation. Each group will independently prepare extracts of a selected Unani drug, following guided instructions. They will begin with understanding the principle and process of their assigned method (1 hour), 2. Followed by the preparation of raw materials (1 hour). 3. The extraction process will be conducted and students will monitor changes in physical characteristics.(3 hours) 4. After completion, each group will document observations, yield, and challenges (2 hours), 5. Followed by a group discussion comparing methods and outcomes (1 hour).
Experiential-Learning Learning 10.3: Fixed and volatile oil of a given sample
(Total Duration of Activity: 8 hours) 1. The teacher will divide students into 2-5 groups, assigning each group a specific sample for analysis of fixed and volatile oils. In the first hour (1 hour), 2. Students will research the principles of oil extraction and identification methods. They will then perform organoleptic and preliminary solubility tests (1 hour). 3. Extraction techniques using appropriate solvents will be carried out for fixed and volatile oils separately (3 hours). 4. After extraction, students will analyze physical characteristics such as refractive index and specific gravity (1 hour). 5. Finally, students will interpret results, compare findings with standard references, and document their observations in the logbook (2 hour).
Experiential-Learning Learning 10.4: Non-volatile Ether soluble extractive value, Volatile Ether soluble extractive value, Solvent Hexane soluble extractive value, Alcohol-soluble extractive value, and Water soluble extractive value
(Total Duration of Activity: 6 hours)

1. In this experiential learning activity, students will independently determine various extractive values of a given Unani formulation/drug under guided instructions. In the first hour, they will review the theoretical basis and standard procedures for extractive value determination. (1 hour)

2. The next two hours will be spent carefully weighing, soaking, and extracting the sample using different solvents while maintaining observation notes.(2 hours)

3. After extraction, students will dedicate two hours to calculating the respective values based on solvent evaporation and weight differences. (2 hour)s

4. The final hour will be used for recording observations, analyzing trends, and reflecting on variations, ensuring a comprehensive understanding of extractive value determination. (1 hour)

Modular Assessment

Assessment	**Hour**
Instructions— 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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks)	4

- Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks
- Short Answer Questions – 10 Marks

2. Project work – (20 Marks)

- Research & Content -10 Marks
- Presentation & Creativity -5 Marks
- Viva Voce & Explanation - 5 Marks

Or

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

and

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

Semester No : 4

Module 11 : Physico-chemical Evaluation of Unani Drugs-I یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ

Module Learning Objectives

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

1. Describe the basic apparatus used for Tests & Assays as per Unani Pharmacopoeia of India
2. Conduct physico-chemicals analysis of Unani drugs
3. Apply Standardisation techniques for Unani Drugs

Unit 1 Introduction of apparatus, Morphological Examination & Microscopical evaluation of Unani Drugs آلات کا تعارف، یونانی ادویہ کا نظری معائنہ اور خوردبینی تجزیہ

11.1.1 Introduction of apparatus for Tests & Assays as per UPI

11.1.2 Morphological Examination

11.1.2.1 Organoleptic evaluation

11.1.3 Microscopical evaluation

11.1.3.1 Determination of stomatal number

11.1.3.2 Determination of Stomatal index

11.1.3.3 Determination of palisade ratio

11.1.4 Determination of vein islet number

References: 175,176,177,184,185,186

3A	3B	3C	3D	3E	3F	3G
CO4	Describe the apparatus for Tests & Assays as per Unani Pharmacopeia of India	1	Lecture	CC	Knows-how	L&PPT ,L
CO5,CO8	Evaluate the Unani drugs for their Morphological evaluation, Organoleptic evaluation and Macromorphological evaluation	3	Practical11.1	CAN	Shows-how	PER,PAL,DL,PT
CO4,CO5, CO7,CO8	Determine the Stomatal index, palisade ratio, and vein islet number of Unani herbal drugs	6	Experiential-Learning11.1	PSY-GUD	Does	DA,DIS

Unit 2 Ash Value ایش ویلو

11.2.1 Ash Value

11.2.1.1 Introduction

11.2.1.2 Total Ash

11.2.1.3 Determination of Total Ash

11.2.1.4 Acid Insoluble Ash

11.2.1.5 Determination of Acid Insoluble Ash

11.2.1.6 Water Soluble Ash

11.2.1.7 Determination of Water Soluble Ash

11.2.1.8 Sulphated Ash

11.2.1.9 Determination of Sulphated Ash

References: 176,177,184

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO8	Describe the Total Ash, Acid Insoluble soluble Ash, Water soluble Ash and Sulphated Ash	2	Lecture	CC	Knows-how	L&PPT ,L&GD,BS,IBL
CO4,CO5, CO7,CO8	Analyse Ash values of the Unani drugs	5	Practical11.2	CAN	Shows-how	DL,PT,DA,D
CO4,CO5, CO8	Analyse the Ash values of Unani drugs as per Unani Pharmacopoeia	6	Experiential-Learning11.2	CE	Does	D,DL,DA,DIS

Unit 3 Moisture Content نمی کی مقدار

11.3.1 Moisture Content

11.3.1.1 Introduction

11.3.1.2 Need of Determination of Moisture Content

11.3.1.3 Methods of Estimation of Moisture Content

11.3.1.4 Gravimetric Method

11.3.1.5 Water Loss on Drying or Vacuum Oven Method

11.3.1.6 Azeotropic Method

11.3.1.7 Toluene Distillation Method

11.3.1.8 Titrimetric/Chemical Method

11.3.1.9 Karl Fischer Method

References: 176,177,186,188

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO8	Describe the need for determination of Moisture content in Unani drugs Methods of Estimation of Moisture Content	3	Lecture	CC	Knows-how	L&GD,FC,L&PPT
CO4,CO5, CO8	Determine the moisture content of Unani drugs by using the Gravimetric Method and Azeotropic Method Toluene Distillation Method,	4	Practical11.3	PSY-GUD	Shows-how	DA,PER,PT,DL,D
CO4,CO5, CO8	Calculate & analyze the moisture content of the Unani drugs using the Gravimetric Method, Azeotropic MethodToluene Distillation Method, Titrimetric/Chemical Method, Karl Fischer Method	6	Experiential-Learning11.3	PSY-GUD	Does	DA,DL,DIS

Unit 4 Melting Point & pH نقطہ اذابت اور پی ایچ

11.4.1 Melting Point

11.4.1.1 Introduction

11.4.1.2 Determination of Melting Point

11.4.1.3 Determination of Melting Range

11.4.2 pH Value/Introduction

11.4.2.1 Determination of pH values

11.4.2.2 Apparatus

11.4.2.3 Method

References: 176,177,186,188,194

3A	3B	3C	3D	3E	3F	3G

CO4,CO8	Describe pH Values and the melting point of Unani drugs	2	Lecture	CC	Knows-how	L&PPT ,FC,L&GD
CO4,CO5, CO8	Evaluate the Unani drugs for their pH values	4	Practical11.4	CE	Shows-how	PBL,DL,DIS,PER
CO4,CO5, CO8	Determine the melting point and melting range of Unani drugs	4	Experiential-Learning11.4	PSY-ADT	Does	D,DL,PER,DA,PT

Unit 5 Specific Gravity, Density & Solubility مخصوص ثقل اضافی، کثافت اور حل پذیری

11.5.1 Specific Gravity & Density

11.5.1.1 Introduction

11.5.1.2 Methods used to determine the specific gravity

11.5.1.3 Liquids

11.5.1.4 Solids

11.5.2 Solubility

11.5.2.1 Introduction

11.5.2.2 Terms to Indicate Solubility

11.5.2.3 Classes of Solution

11.5.2.4 Factors Affecting the Rate of Solubility

11.5.2.5 Determination of the Solubility of a Solid

References: 176,177,186,188,194

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO8	Describe the concept of specific gravity, density and solubility of Unani drugs	2	Lecture	CC	Knows-how	L&GD,L&PPT ,L_VC

CO4,CO5, CO8	Evaluate the specific gravity, density and solubility of Unani drugs	4	Practical11.5	PSY-GUD	Shows-how	PT,PER,DA,DL
CO4,CO5, CO8	Calculate the values of specific gravity, density and solubility of Unani drugs in the given samples.	4	Experiential-Learning11.5	PSY-GUD	Does	PER,DL,DA,D,PT

Practical Training Activity

Practical Training 11.1 Morphological characteristics of the given Unani drug

(Total Duration of Activity: 3 hours)

1. The teacher will begin by demonstrating the morphological characteristics of the given Unani drug, explaining key features such as texture, color, shape, and size. (1 hour)

2. Students will then work in pairs to closely observe and document the morphological features of the assigned drug samples. They will compare them with reference materials. Next, they will present their findings to the class for discussion and validation, refining their observations through peer and teacher feedback. Finally, students will prepare a structured report summarizing their findings, ensuring a comprehensive understanding of the morphological aspects of the drug. (2 hours)

Practical Training 11.2 **Total Ash value, acid insoluble ash value, water-soluble ash and Sulphated Ash of a given Unani drug.**

(Total Duration of Activity: 5 hours)

1. The teacher will begin by explaining the significance of ash values in assessing the purity and quality of Unani drugs. They will demonstrate the step-by-step procedure for determining total ash, acid-insoluble ash, water-soluble ash, and sulphated ash, ensuring students understand the calculations and their interpretations (1 hour)

2. Students will take measured samples of the given Unani drug and incinerate them in a crucible to obtain total ash. They will then treat the ash with hydrochloric acid to determine acid-insoluble ash, followed by dissolving another portion in water to find the water-soluble fraction. Finally, students will incinerate the sample

with sulphuric acid for sulphated ash determination. They will record observations, calculate percentages, and compare findings to standard limits. The session will conclude with discussions on possible adulterants and quality implications (4 hours).

Practical Training 11.3 **Moisture content of a Unani drug by using the Gravimetric Method**

Moisture content of a Unani drug by using the Azeotropic Method (Toluene Distillation Method)

(Total Duration of Activity: 4 hours)

1. The teacher will begin by describing the principles and significance of moisture content determination in Unani drugs, highlighting the differences between the Gravimetric and Azeotropic (Toluene Distillation) methods. They will demonstrate the proper use of instruments like an analytical balance, desiccator, moisture analyzer, and toluene distillation apparatus, ensuring students understand each procedural step before conducting the experiment. (1 hour)
2. Students will first prepare and weigh the Unani drug sample, drying it in an oven at a controlled temperature to constant weight for the Gravimetric Method, recording weight loss as moisture content. Simultaneously, they will set up the toluene distillation apparatus, boiling the drug sample with toluene, collecting the water in a graduated tube, and calculating moisture content based on water volume. They will compare results, discuss variations, and note implications on drug stability. Finally, students will document findings, interpret the significance of moisture content in Unani drugs, and present their observations. (3 hours)

Practical Training 11.4 **pH values of the given sample of drug**

(Total Duration of Activity: 4 hours)

1. The teacher will begin by demonstrating the correct method of preparing 1% and 10% solutions of the given drug sample using distilled water. They will show how to calibrate the pH meter and take accurate readings, explaining the significance of pH in drug formulation. (1 hour)
2. Students will independently prepare the 1% and 10% solutions of the given drug sample, ensuring proper measurement and mixing techniques. They will calibrate the pH meter using standard buffer solutions and measure the pH of both solutions, recording their observations. Next, they will compare their readings with standard values and analyze possible reasons for variations. Finally, they will document their findings in a report discussing the implications of pH variations in Unani Pharmacy. (3 hours)

Practical Training 11.5 **Solubility of Sodium Chloride in water (gravimetric method of estimation)**

2. Specific gravity of honey

(Total Duration of Activity: 4 hours) .

1. The teacher will begin by explaining the principles of solubility and the gravimetric method of estimation, demonstrating the correct technique for weighing, dissolving, and filtering sodium chloride. They will supervise students, ensuring accuracy in measurements and proper handling of glassware. (30 minutes)
2. Students will weigh a known quantity of sodium chloride and dissolve it in a measured volume of water, stirring as per the method. They will then filter the solution and evaporate the solvent to recover the solute, ensuring precise drying to obtain constant weight. The recovered salt will be weighed and compared with the initial amount to analyze solubility. Students will record observations and discuss results under teacher guidance. (1.5 hour)
3. The teacher will begin by explaining the concept of specific gravity and its significance in evaluating the quality of unani drug. They will demonstrate the correct use of a specific gravity bottle or hydrometer, ensuring students understand the calibration and error minimization techniques. (30 minutes)
4. Students will first weigh an empty specific gravity bottle and then fill it with distilled water to determine its weight. After emptying and drying the bottle, they will repeat the process using honey. By applying the formula, they will calculate the specific gravity and compare it with standard values. Observations will be recorded, and results discussed. (1.5 hour)

Experiential Learning Activity

Experiential-Learning Learning 11.1: Stomatal Number, Stomatal Index, Vein-Islet and Veinlet termination number and palisade ratio of the leaf.

(Total Duration of Activity: 6 hours)

1. Students will first study the theoretical background of stomatal index, palisade ratio, and vein islet number (1 hour), understanding their significance in the identification and quality assessment of Unani herbal drugs.
2. They will then observe prepared slides of known plant samples to familiarize themselves with microscopic structures. Using fresh herbal drug samples, they will prepare slides individually following guided instructions (2.5 hours).
3. Each student will then independently examine and document their findings under the microscope (1.5 hours).

4. Finally, students will analyze their recorded data, compare results with standard references, reflect on their learning experience and submit a brief report (1 hour).
Experiential-Learning Learning 11.2: **Ash values of the given sample**
(Total Duration of Activity: 6 hours) 1. Each student will receive two powdered drug samples—one pure and the other adulterated with a small amount of soil or silica. They will first observe the physical characteristics of both samples (1 hour) and document any noticeable differences. 2. Following this, they will incinerate the samples in a controlled manner, carefully noting changes in color, consistency, and residue formation. After complete incineration, students will weigh the ash obtained and calculate the total ash value, acid-insoluble ash, and water-soluble ash for both samples as per the Unani Pharmacopoeia (4 hours). 3. Finally, they will analyze and compare their results, reflect on the impact of adulteration, and record their findings. (1 hour).
Experiential-Learning Learning 11.3: **Two different methods of determination of moisture content**
(Total Duration of Activity: 6 hours) 1. The teacher will divide the students into two groups, assigning one group to determine the moisture content of Unani drugs using the Gravimetric Method (2 hours) and the other using the Azeotropic Method (1 hours). 2. Each student will individually follow the prescribed method, record their observations, and analyze the results. After completing their respective methods, both groups will come together for a comparative discussion, where they will evaluate the accuracy, efficiency, and applicability of each method in Unani pharmacy. (5 hours)
Experiential-Learning Learning 11.4: **Melting point and melting range of Unani drugs**
(Total Duration of Activity: 4 hours) 1. In this experiential learning activity, students will independently determine the melting point and melting range of selected Unani drugs by following structured instructions. In the first hour (30 minutes),

2. Students will research the theoretical background of melting point determination and its significance in Unani pharmacy. They will then select Unani drugs and document their physical characteristics (30 minutes).

3. Next, they will set up and calibrate the melting point apparatus while predicting expected results based on literature (30 minutes).

4. The actual observation and recording of melting points will follow. (30 minutes)

5. Finally, students will analyze deviations, compare findings with references, and reflect on factors influencing variations (2 hour).

Experiential-Learning Learning 11.5: **Specific gravity, density and solubility of a Unani Drug.**

(Total Duration of Activity: 4 hours)

1. In this experiential learning activity, students will individually determine the specific gravity, density, and solubility of given Unani drug samples through systematic observations and calculations. In the first hour, they will familiarize themselves with the concepts and principles related to these properties through teacher-guided discussions and self-study (1 hour).

2. Next, they will independently measure specific gravity and density (1hour).

3. Following this, they will apply relevant formulas to compute specific gravity and density, cross-verifying their results through repeated trials (1 hour).

4. In the final phase, they will assess solubility by dissolving samples in different solvents, analyzing patterns, and documenting their findings in a structured format (1 hour).

Modular Assessment

Assessment	**Hour**
Instructions— 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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks	4

• Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Project work – (20 Marks) • Research & Content -10 Marks • Presentation & Creativity -5 Marks • Viva Voce & Explanation - 5 Marks Or Any practical in converted form can be taken for assessment (25 Marks). and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment (25 Marks).	
Module 12 : Physico-chemical Evaluation of Unani Drugs-II یونانی ادویہ کا طبعی اور کیمیائی تجزیہ	
Module Learning Objectives (At the end of the module, the students should be able to)	

1. Describe the Tests & Assays needed for Physico-Chemical Ananlysis

2. Conduct physico-chemicals analysis of Unani drugs

3. Apply standardization techniques of Unani drugs

Unit 1 Viscosity لزوجت قوام

12.1.1 Viscosity

12.1.1.1 Introduction

12.1.1.2 Types of Flow

12.1.1.3 Factors influencing the Viscosity

12.1.1.4 Intrinsic Factor

12.1.1.5 Extrinsic Factor

12.1.1.6 Types and Units of Viscosity

12.1.1.7 Determination of Viscosity

12.1.1.8 Selection of Viscometer

References: 176,177,194

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7,CO8	**Describe the Types of Flow and Factors influencing the Viscosity of Unani drugs**	2	Lecture	CC	Knows-how	FC,L&GD,BS,TUT,L &PPT
CO4,CO5, CO7,CO8	**Determine the viscosity of Unani drugs by using a suitable viscometer**	5	Practical12.1	CE	Shows-how	D,DA,DL,DIS,PT

CO4,CO5, CO7,CO8	**Analyse the viscosity of different Unani formulations**	8	Experiential-Learning12.1	CE	Does	PT,D,DL,DA,DIS

Unit 2 Refractive Index & Optical Rotation انعطافی اشاریہ اور نوری گردش

12.2.1 Determination of Refractive index

12.2.2 Optical Rotation

12.2.3 Determination of Specific Optical Rotation

References: 176,177,194

3A	3B	3C	3D	3E	3F	3G
CO4,CO8	**Describe refractive index and optical rotation of Unani drugs**	1	Lecture	CC	Knows-how	L&PPT ,L&GD
CO4,CO5, CO8	**Analyse the refractive index and optical rotation of Unani drugs**	3	Practical12.2	PSY-GUD	Shows-how	DL,DA,PT,DIS

Unit 3 Limit Tests as per UPI and Chemical tests for Phytoconstituents یو پی آئی کے مطابق حدود تفتیش اور نباتی اجزاء کے لیے کیمیاوی تفتیش

12.3.1 Overview of Limit Tests as per UPI

12.3.2 Identification of Phytoconstituents/Assay of Metabolites

12.3.2.1 Alkaloids

12.3.2.2 Glycosides and Carbohydrates

12.3.2.3 Reducing and Non Reducing Sugars

12.3.2.4 Phytosterols

12.3.2.5 Proteins and Free Amino Acids

12.3.2.6 Flavanoids

12.3.2.7 Saponins

12.3.2.8 Phenols

12.3.2.9 Gums and mucilage

12.3.2.10 Resins

12.3.2.11 Tannins

12.3.2.12 Volatile Oil

References: 174,176,177,183,184,185

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7,CO8	Describe the Overview of Limit Tests and Chemical Tests for Phytoconstituents as per Unani Pharmacopoeia of India	3	Lecture	CC	Knows-how	L&PPT ,FC,L&GD
CO5,CO8	**Evaluate the sample of a drug for alkaloids, Glycosides, Carbohydrates, Reducing and Non-Reducing Sugars, Phytosterols, Proteins and Free Amino Acids, Flavanoids, Saponins, Phenols, Gums and mucilage, Resins and Tannins.**	6	Practical12.3	CE	Shows-how	D,DA,DIS,PT
CO4,CO5, CO8	**Calculate the values of alkaloids, Glycosides, Carbohydrates, Reducing and Non-Reducing Sugars, Phytosterols, Proteins and Free Amino Acids, Flavanoids, Saponins, Phenols, Gums and mucilage, Resins, Tannins and Volatile oil in the given samples of the drugs.**	10	Experiential-Learning12.2	PSY-GUD	Does	D,DL,DA

Unit 4 Determination of Constants of Fats and Oils شحوم وروغنیات کے معیار کا تعین

12.4.1 Determination of Constants of Fats and Oils

12.4.1.1 Saponification Value

12.4.1.2 Iodine Value

12.4.1.3 Acid Value

12.4.1.4 Peroxide Value

12.4.1.5 Unsaponifiable Matter

12.4.1.6 Determination Of Mineral Oil (Holde's Test)

12.4.1.7 Rancidity Test (Kreis Test)

12.4.1.8 Test For Archis Oil

12.4.1.9 Test For Cotton Seed Oil

12.4.1.10 Test For Sesame Oil

12.4.1.11 Test For Almond Oil

References: 174,176,184,185,186,188

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO8	Enlist & Discuss the constants of fats and oils viz. Saponification Value, Iodine Value, Acid Value, Peroxide Value, Unsaponifiable Matter	4	Lecture	CC	Knows-how	DIS,BS,FC,L&GD
CO4,CO5, CO8	**Demonstrate Holde's Test and Rancidity (Kreis Test)**	6	Practical12.4	PSY-GUD	Shows-how	PT,DA,PER,D,DL
CO4,CO5, CO8	**Assess the quality of the oil-containing drugs**	8	Experiential-Learning12.3	PSY-ADT	Does	DL,DA,TPW,PSM,DIS

Practical Training Activity

Practical Training 12.1 **Viscosity of Arq using Ostwald's U tube viscometer**

(Total duration of Activity: 5 hours)

1. The teacher will begin by explaining the concept of viscosity and its importance in evaluating Arq formulations. They will demonstrate the setup and working principle of Ostwald's U-tube viscometer, emphasizing key factors affecting viscosity measurement. The teacher will supervise the practical session, ensuring proper handling of the apparatus and guiding students in accurate readings. (1 hour).

2. Students will prepare the Arq samples, fill the viscometer, and measure flow time under controlled conditions. They will calculate viscosity using the standard equation, compare results with water as a reference, and analyze factors influencing viscosity variations. Observations and calculations will be documented, followed by a discussion on pharmaceutical implications. Finally, students will compile a report detailing their findings. (4 hours).

Practical Training 12.2 **Refractive index and optical rotation of a given sample of Unani drug**

(Total duration of Activity: 3 hours)

1. The teacher will begin by explaining the principles of refractive index and optical rotation, demonstrating the use of the Abbe refractometer and polarimeter with a Unani drug sample. They will highlight calibration, sample preparation, and accurate measurement techniques, ensuring students understand the scientific significance of these parameters (1 hour).

Students will actively participate by preparing their own samples, taking refractive index and optical rotation readings under supervision, and recording observations. They will analyze variations, compare results, and discuss interpretations. Each group will then compile data into record book. (2 hours).

Practical Training 12.3 **Phytoconstituents in the given Unani drug:**

Alkaloids,Glycosides, Carbohydrates, Reducing and Non-Reducing Sugars, Phytosterols, Proteins and Free Amino Acids, Flavanoids, Saponins, Phenols, Gums and mucilage, Resins, and tannins.

(Total duration of Activity: 6 hours)

1. The teacher will begin by explaining the significance of phytoconstituents in Unani drugs, their therapeutic roles, and the principles of qualitative analysis. They will demonstrate one or two phytochemical tests to set a reference standard for students and guide them in handling reagents safely. (1 hour).

2. Students will work in small groups, performing qualitative tests for alkaloids, glycosides, carbohydrates, reducing and non-reducing sugars, phytosterols, proteins, free amino acids, flavonoids, saponins, phenols, gums, mucilage, resins, and tannins using appropriate reagents. They will document color changes,

precipitate formations, or other observable reactions, compare results with standard references, and discuss their interpretations. A concluding discussion will allow students to present findings and troubleshoot discrepancies under teacher supervision (5 hours).
Practical Training 12.4 **Holde's Test and Rancidity (Kreis Test)**
(Total duration of Activity: 6 hours) 1. Teachers should begin by explaining the significance of rancidity in Unani Pharmacy, focusing on its impact on the stability and efficacy of oils. They should demonstrate Holde's Test and Kreis Test, ensuring students understand the chemical principles behind color changes and odor formation. (1 hour). 2. Students will first take oil samples, including fresh and rancid oils, for testing. They will conduct Holde's Test by reacting oil and observing color changes, followed by the Kreis Test . Results will be recorded and analyzed to assess rancidity levels. (Sample Preparation: 1.5 hrs, Testing: 2.5 hrs, Observation & Discussion: 1 hr).
Experiential Learning Activity
Experiential-Learning Learning 12.1: **Analysis of viscosity of different Unani formulations**
(Total duration of Activity: 8 hours) 1. Each student will individually measure the viscosity of different Unani formulations using a viscometer, following the teacher's instructions. They will record observations, compare their results with standard values from the Unani Pharmacopoeia, and analyze deviations. The activity begins with a conceptual understanding of viscosity and its significance in Unani formulations (1 hour). 2. Followed by hands-on viscosity measurement of provided samples (3 hours). 3. Students will then compare their findings with standard values and discuss variations (2 hour). 4. They will document their observations in a structured format (1 hour) and present their insights in a group discussion for critical analysis (1 hour).
Experiential-Learning Learning 12.2: **Preliminary phytochemical screening of a Unani drugs.**
(Total duration of Activity: 10 hours)

1. The teacher will divide students into 2-5 groups, assigning each group a specific Unani drug sample for analysis. Over ten hours, students will first research the phytochemical constituents of their assigned drug (1 hour).

2. Followed by preparing reagents and setting up their workspace (2 hours).

3. They will then conduct preliminary phytochemical tests to identify alkaloids, glycosides, carbohydrates, reducing and non-reducing sugars, phytosterols, proteins, free amino acids, flavonoids, saponins, phenols, gums, mucilage, resins, tannins, and volatile oils (3.5 hours).

4. Each group will systematically record observations, interpret findings, and discuss results among themselves (1.5 hours).

5. Finally, they will present their findings to the class, justifying their interpretations and comparing results with existing literature (2 hours).

Experiential-Learning Learning 12.3: **Constants of fats in oil-containing drugs**

(Total duration of Activity: 8 hours)

1. The teacher will divide students into 2-5 groups and assign each group a specific oil-containing drug sample. Over six hours, students will independently assess its quality through various analytical parameters. In the first hour, they will research the significance of Saponification Value, Iodine Value, Acid Value, Peroxide Value, and Unsaponifiable Matter (1 hour).

2. Next, they will perform calculations and prepare necessary reagents (1 hour).

3. They will then conduct tests under minimal guidance, carefully noting observations (3 hours).

4. Data analysis and interpretation will follow, comparing their findings with standard values (1 hour).

5. Finally, each group will present their conclusions, highlighting deviations and possible reasons (2 hours).

Modular Assessment

Assessment	**Hour**
Instructions— Conduct a structured Modular assessment. The assessment will be for 25 marks per credit. 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 6 C.	4

1. Viva Voce (25 Marks)

- Understanding of Concepts – 5 Marks
- Communication & Justification of Answers – 10 Marks
- Application & Critical Thinking – 5 Marks
- Response to Questions & Presence of Mind – 5 Marks

2. Practical Assessments (Hands-on preparation and demonstration) (25 marks)

- Practical Execution & Skills - 10 Marks
- Observation, Analysis & Interpretation - 10 Marks
- Report & Presentation - 5 Marks

Or

1. Written examination (30 marks)

- Objective Questions (MCQs/Fill in the Blanks/True-False) –20 Marks
- Short Answer Questions – 10 Marks

2. Project work – (20 Marks)

- Research & Content -10 Marks
- Presentation & Creativity -5 Marks
- Viva Voce & Explanation - 5

Or

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

and

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

Semester No : 5

Module 13 : Chromatographic Techniques کرومیٹو گرافک تکنیکس

Module Learning Objectives

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

1. Describe the basic Principles, types and instrumentation of Chromatography

2. Perform the chromatographic analysis on a given sample of the drug material

3. Calculate the Rf value and identify the compound in a given sample

Unit 1 Introduction of Chromatography, Types, Principle, apparatus, instrumentation کرومیٹوگرافی کا تعارف،اقسام،اصول،آلات

13.1.1 Introduction of Chromatography, Types, Principle, apparatus, instrumentation

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	**Describe the principles and types of Chromatography**	1	Lecture	CC	Knows-how	L,L&PPT
CO4,CO5, CO7,CO8	**Demonstrate the types of chromatography**	4	Practical13.1	PSY-GUD	Shows-how	DL,PT,DIS,PER
CO4,CO5, CO8	**Identify & apply with the apparatus and instruments of chromatography**	1	Experiential-Learning13.1	PSY-SET	Does	W,DL

Unit 2 Paper chromatography پیپر کرومیٹوگرافی

13.2.1 Paper chromatography

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G

CO4,CO5, CO7	Describe the concept of Paper chromatography	1	Lecture	CC	Knows-how	L,L_VC,L&PPT
CO4,CO5, CO7,CO8	Analyze the drug using the Paper chromatography technique	2	Experiential-Learning13.2	PSY-MEC	Does	PER,DIS,D

Unit 3 Thin Layer chromatography تھن لیئر کرومیٹوگرافی

13.3.1 Thin Layer chromatography

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the concept of Thin Layer chromatography	2	Lecture	CC	Knows-how	L,L_VC,L&PPT
CO4,CO5, CO7	Demonstrate the technique of Thin Layer chromatography	5	Practical13.2	PSY-GUD	Shows-how	D-M,DL,D
CO4,CO5, CO7,CO8	Analyze the drug using the Thin Layer chromatography technique	8	Experiential-Learning13.3	PSY-MEC	Does	D-M,DL,DIS,DA,D

Unit 4 High Performance Thin Layer Chromatography ہائی پرفارمنس تھن لیئر کرومیٹوگرافی

13.4.1 High Performance Thin Layer Chromatography

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the High-Performance Thin Layer Chromatography	1	Lecture	CC	Knows-how	L&PPT ,L_VC,L

CO4,CO5, CO7	Demonstrate the technique of High-Performance Thin Layer Chromatography	4	Practical13.3	PSY-GUD	Shows-how	D,FV,PER,DL
CO4,CO5, CO7,CO8	Analyze the drug using the High-Performance Thin Layer Chromatography technique	4	Experiential-Learning13.4	PSY-GUD	Does	PER,DIS,JC
Unit 5 Column chromatography کالم کرومیٹوگرافی 13.5.1 Column chromatography **References:** 191,192,198,199						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO4,CO5, CO7	Describe the techniques of **Column chromatography**	1	Lecture	CC	Knows-how	L,L&PPT ,L_VC
CO4,CO5, CO7,CO8	Evaluate the constituents of Unani drugs using column Chromatography	2	Experiential-Learning13.5	PSY-GUD	Does	SIM,ML,DL,PAL
Unit 6 High-Performance Liquid chromatography ہائی پرفارمنس لیکویڈ کرومیٹوگرافی 13.6.1 High-Performance Liquid chromatography **References:** 191,192,198,199						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO4,CO5, CO7	Describe the High-Performance Liquid chromatography	1	Lecture	CC	Knows-how	L,L_VC,L&PPT
CO4,CO5, CO7	Demonstrate the technique of High-Performance Liquid chromatography	4	Practical13.4	CAP	Shows-how	FV,PER,D

CO4,CO5, CO7	Analyze the constituents of Unani drugs using High-Performance Liquid chromatography	3	Experiential-Learning13.6	PSY-GUD	Does	FC,DIS,JC,PER
Unit 7 Gas chromatography گیس کرومیٹوگرافی 13.7.1 Gas chromatography **References:** 191,192,198,199						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO4,CO5, CO7	Describe Gas chromatography	1	Lecture	CC	Knows-how	L,L_VC,L&PPT
CO4,CO5, CO7	Perform the technique of Gas chromatography on Unani drugs	3	Practical13.5	PSY-GUD	Shows-how	PAL,DL,PER,FV,D
CO4,CO5, CO7	Analyze the constituents of Unani drugs using Gas chromatography	6	Experiential-Learning13.7	PSY-GUD	Does	DIS,PER,FV,D
Unit 8 Ion exchange chromatography آئن ایکسچینج کرومیٹو گرافی 13.8.1 Ion exchange chromatography **References:** 191,192,198,199						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO4,CO5, CO7	Describe the Ion exchange chromatography	1	Lecture	CC	Knows-how	L,L_VC,L&PPT
Unit 9 Advanced Chromatographic Techniques جدید کرومیٹوگرافک تکنیکس						

13.9.1 Overview of Advanced Chromatographic Techniques

13.9.1.1 Supercritical Fluid Chromatography (SFC)

13.9.1.2 Ultra-performance liquid chromatography (UPLC)

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the Advanced Chromatographic Techniques viz. Supercritical Fluid Chromatography (SFC) and Ultra-performance liquid chromatography (UPLC)	1	Lecture	CC	Knows-how	L&GD,L&PPT

Practical Training Activity

Practical Training 13.1 **Various types of chromatography**

(Total duration of Activity: 4 hours)

1.Teachers should begin with a brief theoretical explanation of chromatography, highlighting its principles and various types, such as paper, thin-layer, gas, and high-performance liquid chromatography. They should demonstrate a simple chromatographic technique, like thin-layer chromatography to provide students with a visual understanding before guiding them through the hands-on activity (1 hour).

2. Students will work in small groups to perform TLC using herbal extracts, observing separation patterns and recording their findings. They will then prepare a detailed chart illustrating different chromatography types, their principles, and applications in Unani Pharmacy. Each group will present their charts, followed by a discussion on the advantages and limitations of each method. (3 hours).

Practical Training 13.2 Thin Layer chromatography

(Total duration of Activity: 5 hours)

1. The teacher will begin by explaining the principle, methodology, and significance of Thin Layer Chromatography (TLC) in Unani Pharmacy. They will demonstrate the spotting technique, and solvent system selection while emphasizing safety precautions and troubleshooting. (30 min).

2. Students will extract the sample, dissolve it in a suitable solvent, and spot it on the plate using a capillary tube. After developing the chromatogram in a solvent chamber, they will visualize the spots under UV light or iodine vapors, calculate Rf values, and compare them with standards. Finally, they will document observations and interpret the results. (4 hr 30 min).
Practical Training 13.3 High-Performance Thin Layer Chromatography
(Total duration of Activity: 4 hours) 1. Teachers should begin with a brief theoretical explanation of High-Performance Thin Layer Chromatography (HPTLC), highlighting its significance in Unani Pharmacy for quality control and standardization. If the instrument is unavailable, they should arrange a demonstration through repository videos or organize a visit to an external laboratory for hands-on exposure. (1 hour). 2. Students will prepare herbal extracts, apply samples onto pre-coated TLC plates, and develop them in a suitable solvent system. After development, they will visualize spots under UV light and document Rf values for identification. If direct instrument access is unavailable, they should analyze recorded chromatograms and interpret the results based on standard references. (3 hours).
Practical Training 13.4 High-Performance Liquid chromatography
(Total duration of Activity: 4 hours) 1. The teacher should begin by explaining the principles and components of High-Performance Liquid Chromatography (HPLC), ensuring students understand its significance in Unani Pharmacy for quality control and standardisation of herbal drugs. If the instrument is unavailable, repository videos should be used, or an external visit to a functional HPLC lab should be arranged to provide hands-on exposure (1 hour). 2. Students will prepare samples of herbal extracts for HPLC analysis, focusing on proper filtration and solvent selection. They will set chromatographic parameters such as mobile phase composition and flow rate, injecting samples under supervision. If using a demonstration video, they must note retention times and peak characteristics, interpreting results to identify active compounds. Post-analysis, a discussion will be conducted on optimizing conditions for better resolution (3 hours).
Practical Training 13.5 Gas chromatography on Unani drugs

(Total duration of Activity: 3 hours) 1. The teacher should begin by explaining the principles and applications of gas chromatography (GC) in the analysis of Unani drugs, highlighting its role in identifying and quantifying volatile compounds. If the instrument is unavailable, the teacher should arrange repository videos or coordinate a visit to an external laboratory for a hands-on demonstration (1 hour). 2. Students will first prepare the Unani drug sample by extraction and filtration, ensuring it meets the necessary standards for GC analysis. They will then inject the sample into the GC instrument and observe the chromatogram, noting retention times and peak intensities. If the instrument is not available, students should analyze recorded chromatograms from repository videos, interpreting data under the teacher's guidance. Finally, they will document their findings and discuss variations in compound detection (2 hours).
Experiential Learning Activity
Experiential-Learning Learning 13.1: **Apparatus and instruments of chromatography**
(Total duration of Activity: 1 hour) 1. Students will individually explore various chromatography apparatus and instruments by handling, observing, and documenting their structural components and functions. Each student will select a chromatography technique, such as TLC, HPTLC, or GC, and identify the specific instruments required for its process. They will then sketch or photograph key apparatus, label parts, and describe their significance in chromatography. Finally, students will compare different instruments, noting their operational principles and applications, and submit a reflective summary on their observations and learning experience (1 hour).
Experiential-Learning Learning 13.2: Paper chromatography technique
(Total duration of Activity: 2 hours) The student will independently perform an analysis of a selected drug sample using the paper chromatography technique under the teacher's guidance. First, they will prepare the chromatographic setup and apply the sample. As the solvent moves, they will observe and record the separation process. Once the chromatogram develops, they will analyze the results, calculate Rf values, and interpret findings. Finally, they will prepare and deliver a brief PowerPoint presentation

summarizing the methodology, observations, and conclusions. This experiential learning enhances analytical thinking and practical understanding of chromatography in drug analysis (2 hour).
Experiential-Learning Learning 13.3: Thin-layer chromatography
(Total duration of Activity: 8 hours) 1. In this experiential learning activity, the student will independently analyze a given drug sample using Thin Layer Chromatography (TLC) under the teacher's guidance. First, they will prepare the sample and stationary phase while understanding the principles behind TLC (2 hours). 2. Next, they will develop the chromatogram by carefully spotting the sample and allowing solvent migration (2 hours). 3. After drying, they will visualize the separated compounds under UV light or a suitable reagent, recording Rf values and observations (2 hours). 4. Finally, they will interpret their findings, compare with reference data, and compile a detailed report on their analysis (2 hours).
Experiential-Learning Learning 13.4: High-Performance Thin Layer Chromatography technique
(Total duration of Activity: 4 hours) 1. The teacher will organize a Journal Club where students will discuss research papers on the analysis of Unani drugs using HPTLC (2 hours). 2. Each student will then select a specific Unani drug and conduct an in-depth literature review on its chromatographic profile, identifying marker compounds and reported methodologies. Using online resources, students will analyze HPTLC images, interpret Rf values, and compare them with standard references (1 hour). 3. Finally, each student will prepare a report summarizing their findings and present their interpretations in a group discussion, fostering critical analysis and peer learning (1 hour).
Experiential-Learning Learning 13.5: Column Chromatography and its Advancement
(Total duration of Activity: 2 hours) Students will begin by exploring the principles of column chromatography through interactive online simulations and research articles. Using virtual lab tools, they will simulate chromatographic separation and analyze retention factors (2 hours) or do hands-on practice on the instrument.

Experiential-Learning Learning 13.6: High-Performance Liquid chromatography
(Total duration of Activity: 3 hours) 1. The teacher will organize a Journal Club where students will explore research papers on the analysis of Unani drugs using High-Performance Liquid Chromatography (HPLC). In the first hour (1 hour), 2. Each student will individually review and summarize a selected paper, focusing on the methodology and key findings. In the second hour (1 hour), 3. Students will present their summaries, critically analyzing the strengths and limitations of the study. In the final hour, a group discussion will be conducted, where students compare different analytical approaches, reflect on challenges in HPLC analysis, and propose how these methods can be applied to Unani formulations (1 hour).
Experiential-Learning Learning 13.7: Gas chromatography
(Total duration of Activity: 6 hours) 1. Students will be divided into groups and assigned specific Unani drugs for constituent analysis using Gas Chromatography (GC). In the first hour, they will explore the theoretical principles of GC through online resources and recorded demonstrations (1 hour). 2. The second and third hours will be dedicated to researching the sample preparation techniques and selection of appropriate GC methods for Unani drugs (2 hours). 3. In the fourth hour, they will analyze published chromatograms, interpreting retention times and peak patterns (1 hour). 4. In the fifth hour, each group will compile their findings into a PowerPoint presentation (1 hour). 5. Finally, in the sixth hour, groups will present their results, followed by a discussion on the significance of GC in Unani drug standardisation (1 hour). Note: If instruments are available, they will visit the lab or else plan to visit outside aboratory to learn all chromatographic techniques once and observe the sample preparation and analysis process. If unavailable, they may also use online resources to study chromatograms and interpret sample data
Modular Assessment

Assessment	**Hour**

Instructions- 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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/ Fill in the Blanks/ True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Project work – (20 Marks) • Research & Content -10 Marks • Presentation & Creativity -5 Marks • Viva Voce & Explanation - 5 Marks Or Project Work (50 Marks)	4

Or Any practical in converted form can be taken for assessment (25 Marks). and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment (25 Marks).	

Module 14 : Spectroscopic Techniques اسپیکٹروسکوپک تکنیکس

Module Learning Objectives

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

1. Describe the basic concept and application of Spectroscopic techniques in drug analysis
2. Demonstrate the working of spectroscopic techniques
3. Evaluate the Unani drugs with the help of various Spectroscopic techniques

Unit 1 Introduction of spectroscopy اسپیکٹروسکوپی کا تعارف

14.1.1 Introduction of spectroscopy

14.1.2 Electromagnetic Radiation

14.1.3 Colorimetery: Principle and working

14.1.4 Beer-Lambert law

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the electromagnetic radiations (EMR) and laws of spectroscopy viz. Beer's law, Lambert's law	2	Lecture	CC	Knows-how	L_VC,L&GD,L&PPT
CO4,CO5, CO7	Demonstrate the principle and working of Colorimetery	4	Practical14.1	PSY-GUD	Shows-how	DIS,PER,D

CO4,CO5, CO7,CO8	Analyse Unani drugs using colorimetery	5	Experiential-Learning14.1	PSY-MEC	Does	DL,FV,DIS,D,PER

Unit 2 UV-Visible spectroscopy یو۔وی۔وزبل اسپیکٹروسکوپی

14.2.1 UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Applications of UV- Visible spectroscopy

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7,CO8	Describe the theory, laws and instrumentation of UV-Visible spectroscopy	2	Lecture	CC	Knows-how	L_VC,L&GD,L&PPT
CO4,CO5, CO7	Demonstrate the applications of UV- Visible spectroscopy	4	Practical14.2	PSY-GUD	Shows-how	DL,PER,DIS,D
CO4,CO5, CO7	Evaluate the Unani drugs using UV- Visible spectroscopy	7	Experiential-Learning14.2	PSY-MEC	Does	D,FV,DL,DIS,PER

Unit 3 Vibrational Spectroscopy وائیبریشنل اسپیکٹروسکوپی

14.3.1 Vibrational Spectroscopy

14.3.1.1 IR spectroscopy: Principle, Instrumentation and Applications

14.3.1.2 Raman Spectroscopy

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7,CO8	Describe the principle and instrumentation of Infrared (IR) spectroscopy	1	Lecture	CC	Knows-how	L,L&PPT ,L_VC

CO4,CO5, CO7,CO8	Demonstrate the applicationsof Infrared (IR) spectroscopy	4	Practical14.3	CAP	Shows-how	D,BS,PER,DIS
Unit 4 Flame emission spectroscopy فلیم ایمیشن اسپیکٹروسکوپی 14.4.1 Flame emission spectroscopy: Principle, Instrumentation and Applications **References:** 191,192,198,199						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO4,CO5, CO7,CO8	Describe the principle and instrumentation of Flame emission spectroscopy	1	Lecture	CC	Knows-how	L_VC,L&PPT ,L
CO4,CO5, CO7,CO8	Demonstrate the applications of Flame emission spectroscopy	4	Practical14.4	CAP	Shows-how	PER,FV,DL,D
CO4,CO5, CO7	Analyze the Unani drugs using the Flame emission spectroscopy technique	7	Experiential-Learning14.3	PSY-GUD	Does	FV,BL,SY,PER
Unit 5 Atomic absorption spectroscopy اٹامک ابزارپشن اسپیکٹروسکوپی 14.5.1 Atomic absorption spectroscopy: Principle, Instrumentation and Applications **References:** 191,192,198,199						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO4,CO5, CO7	Describe the principle and instrumentation of Atomic absorption spectroscopy	1	Lecture	CC	Knows-how	L&PPT ,L_VC,L&GD,L
CO4,CO5, CO7	Demonstrate the application of Atomic absorption spectroscopy	4	Practical14.5	CAP	Shows-how	PER,FV,D

CO4,CO5, CO7	Analyze the Unani drugs using the Atomic absorption spectroscopy technique	7	Experiential-Learning14.4	CAN	Does	SY,BL,DIS,PER

Unit 6 NuclearMagnetic Resonance Spectroscopy نیوکلیئرمیگنیٹک ریزونس اسپیکٹروسکوپی

14.6.1 NuclearMagnetic Resonance Spectroscopy (NMR)

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the Nuclear Magnetic Resonance Spectroscopy (NMR)	1	Lecture	CC	Knows-how	L&PPT ,L,L_VC

Unit 7 Mass Spectroscopy ماس اسپیکٹروسکوپی

14.7.1 Mass Spectroscopy (MS)

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the Mass Spectroscopy (MS)	1	Lecture	CC	Knows-how	L,L_VC,L&PPT

Unit 8 FTIR, ICP-OES & ICP-MS ایف ٹی آئی آر، آئی سی پی۔او ای ایس اور آئی سی پی۔ایم ایس

14.8.1 Brief description of the following

14.8.1.1 Fourier Transform Infrared Spectrometry (FTIR)

14.8.1.2 Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)

14.8.1.3 Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

References: 191,192,198,199

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO7	Describe the Fourier Transform Infrared Spectrometry (FTIR), Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)	1	Lecture	CC	Knows-how	L&PPT ,L_VC,L

Practical Training Activity

Practical Training 14.1 Principle and working of Colorimetery

(Total duration of Activity: 4 hours)

1. The teacher will begin by explaining the principle of colorimetry, including the Beer-Lambert law, light absorption, and transmittance. A demonstration of a colorimeter's components and working mechanism will follow, ensuring students understand calibration and sample analysis (1 hour).

2. Students will calibrate the colorimeter using standard solutions of known concentrations and record absorbance values. They will prepare herbal extracts, dilute them appropriately, and measure their absorbance. Data will be used to plot a calibration curve and determine the unknown concentration of an herbal sample. Finally, students will analyze and interpret the results, discussing errors and improvements (3 hours).

Practical Training 14.2 UV- Visible spectroscopy

(Total duration of Activity: 4 hours)

1. Teachers should begin by explaining the fundamental principles of UV-Visible spectroscopy, its instrumentation, and its applications in Unani Pharmacy. They should demonstrate the calibration of the spectrophotometer and guide students on sample preparation techniques before allowing them to conduct the experiment independently (1 hour). 2. Students will prepare standard solutions and measure their absorbance at different wavelengths using a UV-Visible spectrophotometer. They will generate a calibration curve, determine the λmax, and analyze unknown samples for concentration estimation. After data collection, they will interpret results, compare them with standard references, and discuss their findings in a brief report (3 hours).
Practical Training 14.3 Infrared (IR) spectroscopy
(Total duration of Activity: 4 hours) 1. Teachers should begin with a brief explanation of IR spectroscopy, emphasizing its significance in identifying functional groups in Unani drugs. They should demonstrate sample preparation and the operational aspects of the IR spectrometer, ensuring students understand the interpretation of spectra. If an instrument is unavailable, teachers should arrange a visit to an external laboratory or provide repository videos for demonstration. (1 hour) 2. Students will prepare Unani drug samples for IR spectroscopy, ensuring proper sample handling and placement. They will run the instrument under supervision and record spectra for analysis. If a direct experiment is not possible, students will analyze pre-recorded spectra and compare them with reference data using online videos. They will discuss their interpretations, correlating IR peaks with chemical constituents in Unani formulations. The session will conclude with a guided discussion to clarify doubts and refine analytical skills. (2 hours for practical, 1 hour for interpretation and discussion)
Practical Training 14.4 Applications of Flame emission spectroscopy in Unani Drugs
(Total duration of Activity: 4 hours) 1. Teachers should begin with a brief theoretical explanation of Flame Emission Spectroscopy (FES), emphasizing its relevance in analyzing mineral content in Unani drugs. They should demonstrate the instrument's operation, explain safety protocols, and guide students in sample preparation. If the instrument is unavailable, they should arrange a laboratory visit or provide repository videos for virtual learning (1 hour).

2. Students will prepare Unani drug samples by dissolving them in appropriate solvents and filtering them to obtain clear solutions. They will then introduce the samples into the flame emission spectrometer and record emission spectra of elements like sodium, potassium, and calcium. If the instrument is unavailable, they will analyze pre-recorded spectra from online sources. Finally, they will compare results with standard values and interpret the findings through guided discussions (3 hours).
Practical Training 14.5 Application of Atomic absorption spectroscopy in Unani Drugs
(Total duration of Activity: 4 hours) 1. The teacher will begin by explaining the principles and applications of Atomic Absorption Spectroscopy (AAS) in analyzing heavy metals in Unani drugs. They will demonstrate sample preparation techniques and guide students on instrument handling or alternative online resources if the instrument is unavailable. If necessary, an external laboratory visit will be arranged to familiarize students with real-time analysis (1 hour). 2. Students will prepare Unani drug samples using digestion methods and analyze them using AAS or through online repository videos. They will record observations and compare spectral data to standard reference values. In case of external lab visits, they will document procedures and findings. Finally, they will interpret the results through online video tutorials and discussions (3 hours).
Experiential Learning Activity
Experiential-Learning Learning 14.1: colorimetery analysis
(Total duration of Activity: 5 hours) 1. Students will analyze Unani drugs using colorimetry, either by performing tests in the lab or reviewing online research articles if the instrument is unavailable. First, they will receive a brief introduction to colorimetry and its application in Unani Pharmacy (1 hour). 2. Then, they will prepare and analyze samples using a colorimeter or study published data to understand absorbance patterns . If the instrument is unavailable, they will visit a research lab to observe the process firsthand (2 hours). 3. After recording observations, they will prepare a PowerPoint presentation summarizing their findings and interpretations (1 hour), 4. Followed by a discussion session to reflect on their learning (1 hour).

Experiential-Learning Learning 14.2: UV- Visible spectroscopy
(Total duration of Activity: 7 hours) 1. Students will explore the evaluation of Unani drugs using UV-Visible spectroscopy by either performing tests on available samples in the lab (if the instrument is accessible) or reviewing online research papers on spectral analysis of similar drugs. They will begin with a one-hour session understanding the principles of UV-Vis spectroscopy through online resources or instructor guidance (1 hour). 2. Followed by sample preparation and data collection (2 hours) or an external lab visit for hands-on exposure (2 hours). 3. Students will then analyze and interpret the spectral data from their experiments or research findings (2 hours). 4. Compile a brief report on their observations and conclusions (2 hours).
Experiential-Learning Learning 14.3: Flame emission spectroscopy technique
(Total duration of Activity: 7 hours) 1. Students will begin by understanding the principles of Flame Emission Spectroscopy (FES) through online resources and research papers (1 hour). 2. They will then analyze Unani drug samples using the available FES instrument or, if unavailable, visit an external laboratory to observe the process and collect data (3 hours) or review research papers and case studies on the application of FES. 3. After gathering results, they will compare their findings with existing literature to interpret the elemental composition of the samples (2 hours). 4. Finally, students will participate in a symposium, where they will present their observations, discuss challenges, and receive feedback from the teacher and peers (1 hour).
Experiential-Learning Learning 14.4: Atomic absorption spectroscopy
(Total duration of Activity: 7 hours) 1. Students will begin by understanding the principles and applications of Atomic Absorption Spectroscopy (AAS) through online resources, research papers, and recorded lectures (1 hour). 2. They will then review published studies on AAS analysis of Unani drugs, critically analyzing methodologies and results (2 hours).

3. If the instrument is available, students will perform AAS tests on different drug samples, recording their findings (3 hours). If not, they will visit an external laboratory to observe AAS analysis in practice (3 hours) or use online videos. 4. Finally, a symposium will be organized where students will present their learnings, interpretations, and findings to the teacher (1 hour).	
Modular Assessment	
Assessment	**Hour**
Instructions- 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 6 C 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks 2. Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or 1. Written examination (30 marks) • Objective Questions (MCQs/ Fill in the Blanks/ True-False) –20 Marks • Short Answer Questions – 10 Marks 2. Project work – (20 Marks)	4

- Research & Content -10 Marks
- Presentation & Creativity -5 Marks
- Viva Voce & Explanation - 5 Marks

Or

Brief report about outside laboratory visit (50 Marks)

Or

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

and

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

Semester No : 6

Module 15 : Determination of contaminants in Unani drugs یونانی ادویہ میں آلودگیوں کا تعین

Module Learning Objectives

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

1. Descibe the need and importance of limiting various contaminants in Unani drugs in terms of health hazards and quality of the Unani drugs.

2. Identify the various types of contaminants in Unani drugs

3. Apply techniques of Standardization in Unani drugs in terms of contaminants

Unit 1 Microbial Contamination جرثومی آلودگیاں

15.1.1 Microbial Contamination in Unani Drugs

References: 176,177,187

3A	3B	3C	3D	3E	3F	3G
CO5,CO6	Describe the Microbial Contamination in Unani Drugs	1	Lecture	CC	Knows-how	L&PPT ,L&GD,L_VC

CO4,CO5, CO6	Demonstrate the microbial limit test, total microbial count and tests for Specified Micro-organismsas per UPI	3	Practical15.1	PSY-GUD	Shows-how	FV,DL,PER,DIS,D
CO4,CO5, CO6	Analyse Unani drugs for Microbial Contamination Limits	3	Experiential-Learning15.1	PSY-MEC	Does	DIS,D,DA,FV,PER

Unit 2 Aflatoxins افلاٹوکسن

15.2.1 Aflatoxins in Unani Drugs

References: 176,177,187

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6	Describe the contamination of Unani drugs by aflatoxins	1	Lecture	CC	Knows-how	L&PPT ,L_VC,L
CO4,CO5, CO6	Perform the test for Aflatoxins	2	Practical15.2	PSY-GUD	Shows-how	DL,D,DIS,PER,FV
CO4,CO5, CO6	Analyse Unani drugs for the permissible Limit of Aflatoxins	3	Experiential-Learning15.2	PSY-MEC	Does	DIS,SIM,D,PER,FV

Unit 3 Pesticide residue کیڑےمکوڑےباقیات

15.3.1 Pesticide residue in Unani Drugs

References: 176,177,187

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6	Describe the Pesticide residue in Unani drugs	1	Lecture	CC	Knows-how	LS,L&PPT ,L&GD

CO4,CO5, CO6	Demonstrate the tests for pesticide residue in Unani drugs	2	Practical15.3	PSY-GUD	Shows-how	PER,D,FV,DIS,DL
CO4,CO5, CO6	Identify the Pesticide residue in Unani drugs	3	Experiential-Learning15.3	PSY-MEC	Does	RLE,PER,DL,D,DA

Unit 4 Heavy Metals ثقیل دھاتیں

15.4.1 Heavy Metals-Contaminant in Unani Drugs

References: 176,177,187

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6	Describe the heavy metal contamination in Unani drugs	1	Lecture	CC	Knows-how	L&PPT ,L&GD
CO4,CO5, CO6	Demonstrate the Limit Test for Heavy metals	3	Practical15.4	PSY-GUD	Shows-how	DIS,DL,PER,FV,D
CO4,CO5, CO6	Analyse the amount of heavy metals in Unani drugs	4	Experiential-Learning15.4	PSY-MEC	Does	PER,D,DA,FV,DIS

Unit 5 Radioactive contamination ریڈیواکٹیو آلودگی

15.5.1 Radioactive contamination in Unani Drugs

References: 176,177,187

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6	Describe the radioactive contamination in Unani drugs	1	Lecture	CC	Knows-how	L&PPT ,L&GD,L_VC

Practical Training Activity
Practical Training 15.1 Microbial limit test, total microbial count and tests for Specified Micro-organismsas per UPI
(Total duration of Activity: 3 hours) 1. Teachers should begin by explaining the significance of microbial limit tests in assessing the safety of unani drugs, referencing UPI guidelines. They should demonstrate sample preparation, plating techniques, and incubation methods while emphasizing sterile handling. If laboratory facilities are unavailable, they should arrange visits to external labs or provide repository videos for better understanding. (30 min) 2. Students will collect samples, prepare dilutions, and perform microbial plating on selective media to determine total microbial count and detect specified microorganisms. They will incubate plates and observe microbial growth, comparing results with UPI standards. In case of limited facilities, students will interpret results using online videos or external lab visits. (150 min)
Practical Training 15.2 Test for Aflatoxins
(Total duration of Activity: 2 hours) 1. The teacher will begin by explaining the significance of aflatoxin testing in Unani Pharmacy, emphasizing its impact on the safety and efficacy of herbal formulations. They will demonstrate the sample preparation process and guide students through the standard protocol as per ASU regulations. If an in-house facility is unavailable, they will arrange a visit to an external laboratory or provide online resources for better understanding. (60 minutes) 2. Students will actively participate by preparing herbal samples, extracting aflatoxins using solvent methods, and conducting tests following ASU protocol. They will compare results with standard references, interpret fluorescence under UV light, and document findings. In case of external lab visits, they will observe advanced techniques and interact with experts. Finally, they will discuss their observations, ensuring they understand practical implications for Unani medicine safety. (60 minutes)
Practical Training 15.3 Tests for pesticide residue in Unani drugs
(Total duration of Activity: 2 hours)

1. The teacher will begin with a brief introduction (15 minutes) on pesticide residue contamination in Unani drugs, its health hazards, and the importance of regulatory protocols as per ASU guidelines. They will then demonstrate the sample preparation and initial extraction process, ensuring students understand the critical steps. If lab facilities are unavailable, they will arrange an external lab visit or show relevant online videos for better clarity. (30 minutes) 2. Students will actively conduct the experiment, starting with sample selection, extraction using solvents, and filtration. They will then perform chromatographic analysis, such as Thin Layer Chromatography (TLC) or Gas Chromatography-Mass Spectrometry (GC-MS), under supervision. After obtaining results, they will interpret the presence of pesticide residues based on standard reference values. Each student will document observations and discuss findings in a concluding sessions to reinforce learning and practical application. (90 minutes)
Practical Training 15.4 Demonstrate the Limit Test for Heavy metals
(Total duration of Activity: 3 hours) 1. The teacher will begin by explaining the significance of the limit test for heavy metals in Unani pharmacy, emphasizing safety and regulatory requirements as per ASU protocols. They will demonstrate sample preparation, reagent handling, and the visual comparison method, ensuring students understand each step. If lab facilities are unavailable, the teacher will arrange visits to a certified laboratory or guide students to reliable online resources (30 minutes). 2. Students will perform the test in three phases: sample preparation (30 minutes), reagent addition and reaction observation (1 hour), and result interpretation with discussion (1 hour). . Each student must document their observations and validate their findings with reference limits. Those unable to perform the test physically will analyze case studies, watch demonstration videos, and discuss interpretations.
Experiential Learning Activity
Experiential-Learning Learning 15.1: Microbial Contamination Limits
(Total duration of Activity: 3 hours) 1. Students will visit a microbiology laboratory to observe and analyze microbial contamination in Unani drugs under expert supervision. If access to a lab is not available, they will watch detailed online videos demonstrating microbial contamination testing methods. In the first hour, they will document key observations on sample preparation, culturing, and contamination identification (1 hour).

2. In the next two hours, they will create visual charts summarizing contamination limits, common microbes, and regulatory standards. Teachers will guide discussions and clarify doubts, but students will take the lead in analyzing results and presenting findings, fostering a deep, hands-on understanding of contamination assessment (2 hours).

Experiential-Learning Learning 15.2: Aflatoxins in Unani Drugs

(Total duration of Activity: 3 hours)

1. Students will visit an advanced analytical laboratory specializing in mycotoxin analysis or engage with virtual lab simulations and expert-led online videos to understand aflatoxin detection in Unani drugs. They will observe sample preparation, extraction, and quantification using chromatographic techniques. After the visit, students will individually analyze the permissible aflatoxin limits set by regulatory authorities and compare them with real-time findings. They will create visual charts, infographics, and reports summarizing their observations, challenges in aflatoxin analysis, and regulatory perspectives. Teachers will guide discussions and assess students' analytical interpretation and presentation skills (3 hours)

Experiential-Learning Learning 15.3: Pesticide residue in Unani drugs

(Total duration of Activity: 3 hours)

1. Students will engage in an experiential learning activity to detect pesticide residues in Unani drugs, guided by their teacher. In the first hour (1st hour), the teacher will introduce pesticide contamination in herbal drugs and discuss its impact on safety and efficacy. Students will then review case studies and regulatory guidelines.

2. In the second hour (2nd hour), they will visit a specialized laboratory or analyze online demonstration videos of pesticide residue detection techniques.

3. The third hour (3rd hour) will focus on students individually interpreting test reports and identifying contamination patterns. Students will present their findings, discuss challenges in pesticide detection, and reflect on the importance of quality assurance in Unani Pharmacy.

In this activity, students will take an active role by exploring real-world contamination cases, critically analyzing laboratory results, and engaging in discussions. They will enhance their understanding by correlating theoretical knowledge with practical applications through lab visits or virtual demonstrations. The experiential learning approach will allow them to reflect on the significance of detecting pesticide residues and develop problem-solving skills relevant to Unani Pharmacy.

Experiential-Learning Learning 15.4: Heavy metals in Unani drugs	
(Total duration of Activity: 4 hours) 1. The students will first gather in their respective groups and receive a briefing from the teacher on the significance of heavy metal analysis in Unani formulations. In the first hour, they will research the standard protocols for heavy metal analysis using online resources and instructional videos, noting key techniques and safety measures. 2. In the second hour, they will visit a specialized laboratory if their institution lacks the necessary facilities, where they will observe the equipment and interact with experts. 3. After a short break, the third hour will be spent in discussion, where students will reflect on their observations, compare findings with their initial research, and discuss challenges in heavy metal detection. 4. In the final hour, each group will present their learning experience, focusing on protocol variations, analytical challenges, and the importance of quality control in Unani pharmacy. The teacher will facilitate discussions, provide insights, and assess students based on their engagement and reflections.	
Modular Assessment	
Assessment	**Hour**
Instructions- Conduct a structured Modular assessment. The assessment will be for 25 marks per credit. 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 6 C. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks Or	2

Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or Any practical in converted form can be taken for assessment. (25 Marks) Or Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Module 16 : Standardisation of compound drugs ادویہ مرکبہ کی معیاربندی

Module Learning Objectives

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

1. Describe the monographs of Unani Compound drugs.

2. Outline the various analytical specifications of Unani compound formulations.

3. Analyze the quality of Unani compound formulations.

Unit 1 Overview of Monographs of Unani Compound Drugs mentioned in UPI Part -II یو پی آئی حصہ دوم میں درج یونانی مرکب ادویہ کے مونو گراف کا جائزہ

16.1.1 Overview of Monographs of Unani Compound Drugs mentioned in UPI Part -II. Analytical Specifications of following compound drugs

16.1.1.1 ‘Araq

16.1.1.2 Sirka

16.1.1.3 Ravghan

16.1.1.4 Joshānda

16.1.1.5 Sharbat

16.1.1.6 Iṭrīfal

16.1.1.7 Ma'jūn

16.1.1.8 Khamīra

16.1.1.9 Marham/Ḍimād/Qayrūṭī

16.1.1.10 Habb/Qurs

16.1.1.11 Safūf

16.1.1.12 Kushta

References: 176,177,197

3A	3B	3C	3D	3E	3F	3G
CO4,CO5	Describe the monographs of Unani Compound Drugs mentioned in UPI Part -II	2	Lecture	CC	Knows-how	FC,L&PPT ,L&GD
CO4,CO5	Illustrate the analytical specificationsof Unani formulations viz. Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, Kushta	5	Practical16.1	CAN	Shows-how	DIS,TUT,PT,DL,PL
CO4	Develop analytical specifications of Unani formulations viz. Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, Kushta	6	Experiential-Learning16.1	CS	Does	PER,DIS,DA,DL,PL

Unit 2 Specific Parameters of Solid Dosage Form Powder and Granules جامد اشکال ادویہ، سفوف اور دانہ دار سفوف کے مخصوص معیارات

16.2.1 Specific Parameters of Powder and Granules

16.2.1.1 Properties for the characterisation of powder and granules

16.2.1.2 Factors affecting the Flow of Powders

16.2.1.3 Evaluation of Flow Properties

References: 194

3A	3B	3C	3D	3E	3F	3G
CO2,CO4, CO5	Describe the Specific Parameters used for analysis of Powder and Granules	1	Lecture	CC	Knows-how	L,L&PPT ,PER,BL,L_VC
CO2,CO4, CO5	Discuss the Factors affecting the Flow of Powders	2	Practical16.2	CC	Shows-how	DL,PT,DIS,PER,BL
CO3,CO5, CO6	Evaluate the Flow Properties of powders and granules	3	Experiential-Learning16.2	CE	Does	PT,W,DA,TUT,DIS

Unit 3 Tablets and Pills قرص وحب

16.3.1 Specific Parameters of Tablets and Pills

16.3.1.1 Hardness

16.3.1.2 Factors Affecting the Hardness of Tablets

16.3.1.3 Friability

16.3.1.4 Disintegration

16.3.1.5 Weight Variation

References: 194,199

3A	3B	3C	3D	3E	3F	3G

CO3,CO4, CO6	Describe various specific parameters for tablets/pills viz. Hardness, WeightVariation, Friability, Disintegration and Dissolution rate	2	Lecture	CC	Knows-how	L&PPT ,FC,BL,L&GD
CO3,CO4, CO6	Demonstrate the tests for Hardness, Weight Variation, Friability, Disintegration and Dissolution rate on tablets/pills	3	Practical16.3	PSY-GUD	Shows-how	DIS,DL,PER,D,DA
CO3,CO4, CO5	Analyze the quality of tablet/pill using various parameters viz. Hardness, Weight Variation, Friability, Disintegration and Dissolution rate	4	Experiential-Learning16.3	PSY-MEC	Does	DIS,DL,DA,PER,D

Practical Training Activity

Practical Training 16.1 Analytical specifications of Unani formulations viz. Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, Kushta

(Total duration of Activity: 5 hours)

1. The teacher will begin by demonstrating the correct procedures for testing the analytical specifications of Unani formulations as per the Protocol for testing of ASU/Unani Pharmacopoeia. They will guide students in selecting appropriate methodologies, handling instruments like pH meters, viscometers, and spectrophotometers, and interpreting results for different dosage forms. The teacher will also oversee students' performance, ensuring adherence to standards and protocols (30 min).
2. Students will work in small groups, each assigned a specific formulation such as Arq, Sharbat, or Kushta. They will conduct tests including organoleptic evaluation and pH determination (30 min), refractive index/viscosity for liquids (1 hr), loss on drying/moisture content (1 hr), ash values/extractive values for solid forms (1 hr), and specific tests like acid value for oils or friability for tablets (1 hr).
3. The final hour will be dedicated to data interpretation, documentation, and discussion of findings with the teacher for validation.

Practical Training 16.2 Factors affecting the Flow of Powders

(Total duration of Activity: 2 hours)

The teacher will begin by explaining the significance of powder flow in Unani pharmacy, highlighting factors such as particle size, shape, moisture content, and surface properties. They will demonstrate the setup for measuring flow properties using different powders and guide students in understanding theoretical aspects before hands-on experimentation. Students will divide into small groups and select different powders. They will measure flow rates using a funnel flow method and angle of repose test, altering conditions like humidity and granule size to observe variations. Each group will record findings, analyze the impact of each factor, and present a comparative discussion. *(Time Breakage: 30 min - Introduction & Demonstration, 90 min - Hands-on Experiment & Discussion).*
Practical Training 16.3 Tests for Hardness, Weight Variation, Friability, and Disintegration rate on tablets/pills.
(Total duration of Activity: 3 hours) 1. Teachers will begin by demonstrating the standard procedures for testing hardness, weight variation, friability, and disintegration of tablets/pills, ensuring students understand the importance of these parameters in quality control. They will guide students in handling instruments like the Monsanto hardness tester, friabilator, and disintegration apparatus while emphasizing accuracy and documentation (30 minutes). 2. Students will then perform tests in small groups, each group working on a set of tablets/pills. They will measure hardness and weight variation, recording deviations (30 minutes). 3. The second hour will be dedicated to friability testing using a friabilator, followed by a break (1 hour). 4. In the final hour, students will conduct disintegration tests, analyze results, and compare them with pharmacopeial standards before presenting their findings (1 hour).
Experiential Learning Activity
Experiential-Learning Learning 16.1: Analytical specifications of Unani formulations viz. Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, Kushta
(Total duration of Activity: 6 hours)

The teacher will divide students into small groups of two to five members, assigning each group a set of Unani formulations such as Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, and Kushta. Each student will independently perform the analytical specifications of the assigned formulation under the teacher's guidance and document observations, fostering a comparative learning approach. Students will then collaborate within their groups to analyze variations in results, discuss factors affecting these differences, and present their findings, promoting critical thinking and peer learning. Additionally, each student will compile a comparative project incorporating multiple formulations to identify trends and quality parameters, enhancing their analytical reasoning and data interpretation skills.

Time breakage: Understanding analytical parameters (1 hour), independent testing and data collection (2 hours), group discussions and comparative analysis (1.5 hours), documentation and report compilation (1 hour), presentation and feedback session with the teacher (0.5 hours).

Experiential-Learning Learning 16.2: Evaluate the Flow Properties of powders and granules

(Total duration of Activity: 3 hours)

The students will be divided into pairs and assigned different powdered and granulated formulations to analyze their flow properties. They will engage in hands-on observation, data collection, and comparative analysis, critically evaluating the impact of ingredient composition on flow behavior. Each group will create a visual representation, such as a chart or model, summarizing their findings. Throughout the session, the teacher will facilitate discussions, provide real-world examples, and guide students in interpreting their observations scientifically.

Time Breakage:

Introduction & Instructions (1 hour) ⟶ Individual Activity & Observation (1 hour) ⟶ Data Analysis & Chart Preparation (1 hour)

Experiential-Learning Learning 16.3: Quality of tablet/pill using various parameters viz. Hardness, Weight Variation, Friability and Disintegration.

(Total duration of Activity: 4 hours)

1. The students will be divided into pairs and assigned different formulations of tablets and pills containing varied ingredients. They will systematically apply testing parameters outlined in the Unani Pharmacopoeia of India (UPI) to analyze hardness, friability and disintegration under the teacher's guidance.

2. The teacher will facilitate discussions, prompting students to compare results, identify formulation-based variations, and hypothesize reasons for differences. Each group will then present their findings, engaging in peer review to refine their understanding. This process fosters analytical thinking and problem-solving

through experiential learning. *(Introduction & Instructions – 30 min, Testing & Data Collection – 120 min, Comparative Analysis & Discussion – 60 min, Presentation & Reflection – 30 min).*	
Modular Assessment	
Assessment	**Hour**
Instructions- Conduct a structured Modular assessment. The assessment will be for 25 marks per credit. 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 6 C. 1. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks Or Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or Any practical in converted form can be taken for assessment. (25 Marks) Or Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	2
Module 17 : Shelf-life & Stability Studies of Unani Drugs یونانی ادویہ کی مدت حیات اور استحکامی مطالعے	

Module Learning Objectives

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

1. Describe the concept and importance of shelf life and stability studies in Unani drugs

2. Conduct stability studies on Unani formulations

3. Calculate the shelf life of the Unani formulations

Unit 1 Shelf-life & Stability Studies مدت حیات اور استحکامی مطالعے

17.1.1 Shelf-life & Stability Studies of Unani Drugs

17.1.1.1 Condition for drying and storage of crude drugs

17.1.1.2 Storage conditions of finished Products

17.1.1.3 Shelf-life of Unani formulations as per D & C Act

17.1.1.4 Concept of Shelf-life/Ā ʻmār-i-Advia (Muddate hayāt) in Unani Literature

References: 158,177,178,181,200

3A	3B	3C	3D	3E	3F	3G
CO2,CO3, CO4,CO5, CO6,CO7	Describe the concept of Shelf-life/Amare Advia (Muddat-e-hayat) in Unani Literature and storage conditions of crude drugs and finished Products	2	Lecture	CC	Knows-how	L&PPT ,L&GD,L_VC,BL,FC
CO3,CO4, CO5,CO6, CO7	Illustrate the Shelf-life of Unani formulations as per D & C Act	3	Practical17.1	CAN	Shows-how	PrBL,DIS,D,W,DL

CO3,CO4, CO5,CO6, CO7	Analyse and Compare the shelf-life of compound drugs mentioned in Unani literature and D & C Act	4	Experiential-Learning17.1	CE	Does	DL,D,DA,DIS,PER
CO3,CO4, CO5,CO7	Develop a protocol for Stability testing	4	Experiential-Learning17.2	CS	Does	SDL,PBL,DIS,PT,DL

Unit 2 Stability Studies استحکامی مطالعے

17.2.1 Stability Studies

17.2.1.1 Introduction of Kinetic drug decomposition and Order reactions

17.2.1.2 Types of Stability Study

17.2.1.2.1 Accelerated Stability

17.2.1.2.2 Long term Stability

17.2.1.2.3 Stress testing

17.2.1.3 Protocol for Stability testing

References: 181,194,200

3A	3B	3C	3D	3E	3F	3G
CO2,CO3, CO5	Describe the order reactions and Kinetic drug decomposition	2	Lecture	CC	Knows-how	L&GD,L&PPT ,L_VC
CO3,CO4, CO5,CO7	Demonstrate various types of Stability Studies viz. Accelerated Stability, Long-term Stability, and Stress testing	5	Practical17.2	PSY-GUD	Shows-how	FV,DL,DIS,W,TUT

Unit 3 International Council for Harmonisation (ICH) انٹرنیشنل کاؤنسل فارہارمونائیزیشن

17.3.1 International Council for Harmonisation (ICH) guidelines for stability testing

References: 193

3A	3B	3C	3D	3E	3F	3G
CO2,CO3, CO4,CO5, CO6,CO7	Describe the ICH guidelines for stability testing	1	Lecture	CC	Knows-how	FC,L,L&PPT ,L&GD
CO2,CO3, CO4,CO5, CO6,CO7	Discuss ICH guidelines for stability testing	2	Practical17.3	CAP	Shows-how	TUT,D,PT,DIS
CO2,CO3, CO4,CO5, CO6,CO7	Design a stability study in view of ICH guidelines for stability testing	5	Experiential-Learning17.3	CS	Does	DIS,D,DL,PER

Practical Training Activity

Practical Training 17.1 Shelf-life of Unani formulations as per D & C Act

(Total duration of Activity: 3 hours)

1. The teacher will illustrate the shelf life of various Unani single drugs as well as Unani formulations as per rules 161B Drugs and cosmetics act 1940 and rules thereunder. Any exception in the shelf life of the drugs should be demonstrated by the teacher. Teachers will begin by providing a brief theoretical overview of the shelf-life of Unani formulations, explaining the factors affecting stability, the importance of expiry dating, and the differences between classical Unani literature and the provisions of the Drugs & Cosmetics (D&C) Act (rules 161B) . They will guide students in understanding regulatory requirements and experimental approaches to assess formulation stability (1 hour).

2. Students will compile a list of shelf-life data from Unani classical texts and the D&C Act and compare them. They will document and interpret the the correlation between shelf-life as given in classical literature and act (2 hours).
Practical Training 17.2 Types of Stability Studies viz. Accelerated Stability, Long-term Stability, and Stress testing
(Total duration of Activity: 5 hours) 1. Teachers will introduce the concept of stability studies in Unani drugs, explaining the importance of Accelerated Stability, Long-term Stability, and Stress Testing as per ICH guidelines. They will demonstrate how environmental factors like temperature, humidity, and light affect drug formulations and guide students in setting up stability chambers and interpreting results (1 hour). 2. Students will submit an assignment following ICH guidelines about three different types of stability studies (4 hours).
Practical Training 17.3 ICH guidelines for stability testing
(Total duration of Activity: 2 hours) 1. Teachers will begin the session by explaining the importance of ICH guidelines for stability testing, focusing on long-term, accelerated, and intermediate stability studies for Unani formulations. They will demonstrate the correct procedure for setting up stability chambers, selecting storage conditions (temperature, humidity), and interpreting results based on ICH parameters. Teachers will also provide guidelines for structuring the students' assignments (30 minutes). 2. After the literary survey, students will compile their findings and submit an assignment outlining stability protocols, test results, and compliance with ICH guidelines (90 minutes).
Experiential Learning Activity
Experiential-Learning Learning 17.1: Shelf-life of compound drugs mentioned in Unani literature and D & C Act
(Total duration of Activity: 4 hours) 1. In this experiential learning activity, students will individually analyze and compare the shelf-life of compound drugs as per Unani literature and the Drugs & Cosmetics Act. Under the teacher's guidance (1 hour).

2. Students will first review classical Unani texts and regulatory documents to identify variations in definitions and criteria for drug stability (1 hour). 3. They will then select specific formulations and critically evaluate their prescribed shelf-life, recording observations in their logbooks (1 hour). 4. Through reflective analysis, students will discuss possible scientific, regulatory, and philosophical reasons for discrepancies, enhancing their understanding of traditional and modern pharmaceutical perspectives (1 hour).
Experiential-Learning Learning 17.2: Protocol for Stability testing
(Total duration of Activity: 4 hours) 1. In the first hour, students will search and select a high-quality research paper on stability testing protocols in Unani formulations. They will analyze the methodology, parameters, and key findings under the teacher's guidance. 2. In the second hour, one of the student will present their selected paper and other participants in a discussion in a journal club, discussing the strengths, limitations, and applicability of different approaches. 3. The third hour will involve drafting an initial stability testing protocol based on insights gained, ensuring it aligns with Unani principles. 4. In the final hour, students will refine their protocols through peer review and faculty feedback, fostering experiential learning.
Experiential-Learning Learning 17.3: Design a stability study in view of ICH guidelines for stability testing
(Total duration of Activity: 5 hours) 1. In this experiential learning activity, students will independently design a comprehensive stability study protocol for both accelerated and long-term stability studies as per ICH guidelines. They will first analyze the key components of stability studies, including conditions, parameters, and regulatory requirements (1 hour). 2. Next, they will draft a detailed protocol, incorporating study design, sampling plans, and analytical methods (2 hours). 3. Students will then critically review and refine their protocols based on simulated regulatory scenarios provided by the teacher (1 hour). 4. In the final stage, they will present and justify their protocols, receiving constructive feedback from peers and the teacher (1 hour).
Modular Assessment

Assessment	Hour
Instructions- Conduct a structured Modular assessment. The assessment will be for 25 marks per credit. 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 6 C. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks Or Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or Field/ Lab report evaluation (25 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) Or Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	2
Module 18 : Analytical/Quality testing laboratory as per Drugs Rules, 1945 ادویہ قوانین1945کے مطابق تجزیہ اوصاف کی تجربہ گاہ	

Module Learning Objectives

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

1. Describe the Advanced Analytical Methods for the analysis of Kushta

2. Assess in-process and product quality control of Kushtajat

3. Plan the in-house quality control section in accordance of Schedule-T.

Unit 1 Analytical/Quality testing laboratory تجزیہ اوصاف کی تجربہ گاہ

18.1.1 Analytical/Quality testing laboratory as per Drugs Rules, 1945

18.1.1.1 In-house Quality control section under Schedule-T

18.1.1.2 Recommended Instruments & equipments

18.1.1.3 Chemistry section

18.1.1.4 Pharmacognosy section

18.1.1.5 Microbiology section

References: 158

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6,CO7	Describe the In-house Quality control section as mentioned in Schedule-T of Drugs Rules, 1945	1	Lecture	CC	Knows-how	L&GD,L&PPT
CO4,CO5, CO6	Identify & Apply with the various instruments & equipments recommended for Chemistry, Pharmacognosy and Microbiology section in an In-house Quality control section	2	Practical18.1	PSY-GUD	Shows-how	D,DIS,PER
CO4,CO5, CO6	Develop an In-house Quality control section as per Schedule-T	4	Experiential-Learning18.1	PSY-SET	Does	PER,D,DIS,TBL

Unit 2 PART XVI (A) of Drugs Rules, 1945 ادویہ قوانین1945 کا حصہ XVI (A)

18.2.1 PART XVI (A) of Drugs Rules, 1945

References: 158

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6	Describe the PART XVI (A) of Drugs Rules, 1945	1	Lecture	CC	Knows-how	L&GD,L&PPT
CO4,CO5, CO6	Acquire the knowledge of the PART XVI (A) of Drugs Rules, 1945	2	Practical18.2	CC	Shows-how	PSM,PER,DIS,PBL
CO4,CO5, CO6	Apply the knowledge of establishing an analytical lab as per PART XVI (A) of Drugs Rules, 1945	4	Experiential-Learning18.2	AFT-SET	Shows-how	TBL,D,PrBL,PER

Unit 3 Quality Control of Kushtajat کشتہ جات کا ضبط اوصاف

18.3.1 Quality Control of Kushtajat as mentioned in Schedule-T

18.3.1.1 In-process Quality Control

18.3.1.2 Product Quality Control

18.3.2 Introduction of Advanced Analytical Methods for analysis of Kushta

18.3.2.1 XRD (X-ray diffraction)

18.3.2.2 AAS (Atomic absorption spectroscopy)

18.3.2.3 TEM (Transmission Electron Microscopy)

18.3.2.4 SEM (Scanning electron microscopy)

18.3.2.5 FTIR (Fourier Transform Infrared Spectroscopy)

18.3.2.6 TGA (Thermogravimetric analysis)

References: 197

3A	3B	3C	3D	3E	3F	3G
CO4,CO5, CO6	Describe the In-process Quality Control and Product Quality Control of Kushtajat as mentioned in Schedule-T	3	Lecture	CC	Knows-how	L&PPT ,L&GD,L_VC
CO4,CO5, CO6	Demonstrate the Advanced Analytical Methods for analysis of Kushta viz. XRD (X-ray diffraction), AAS (Atomic absorption spectroscopy), TEM (Transmission Electron Microscopy), SEM (Scanning electron microscopy), FTIR (Fourier Transform Infrared Spectroscopy), TGA (Thermogravimetric analysis)	6	Practical18.3	PSY-SET	Shows-how	PT,PER,D,DIS,FV
CO4,CO5, CO6	Analyse the sample of Kushta	5	Experiential-Learning18.3	PSY-GUD	Does	DIS,D,DA,PER

Practical Training Activity

Practical Training 18.1 Istruments & equipments recommended for Chemistry, Pharmacognosy and Microbiology section in an In-house Quality control section

(Total duration of Activity: 2 hours)

1. The teacher will begin with a brief introduction (30 minutes) on the importance of quality control in Unani Pharmacy and explain the role of instruments in Chemistry, Pharmacognosy, and Microbiology sections. They will demonstrate key instruments, their working principles, and safety protocols, ensuring students understand their applications.
2. Students will work in groups (60 minutes) to explore and document instruments used in each section. They will physically identify, classify, and note specifications of instruments like spectrophotometers, HPTLC, Soxhlet extractors, colony counters, and laminar airflow.
3. Each group will compile their observations into a structured report. In the final 30 minutes, students will present their findings, and the teacher will provide feedback and clarification.

Practical Training 18.2 Elucidate the PART XVI (A) of Drugs Rules, 1945
(Total duration of Activity: 2 hours) 1. The Student will acquire the knowledge of the PART XVI (A) of Drugs Rules, 1945 through PPT/Video Clip/Demonstration/ presentation/ learning with group discussion/Practical and Mobile Learning/Brainstorming/Project Based Learning/ team Based Learning.
Practical Training 18.3 Advanced Analytical Methods for analysis of Kushta viz. XRD (X-ray diffraction), AAS (Atomic absorption spectroscopy), TEM (Transmission Electron Microscopy), SEM (Scanning electron microscopy), FTIR (Fourier Transform Infrared Spectroscopy), TGA (Thermogravimetric analysis)
(Total duration of Activity: 6 hours) 1. Teachers will begin with a 1 hour briefing on the principles, instrumentation, and applications of XRD, AAS, TEM, SEM, FTIR, and TGA in Kushta analysis. 2. If in-house facilities are unavailable, they will arrange visits to external laboratories or utilize repository videos for demonstration. Teachers will also guide students in sample preparation and data interpretation. Students will spend in hands-on sample analysis using available instruments or virtual simulations. They will prepare Kushta samples, operate instruments under supervision, and record spectra or images (4 hours) . 3. In the final 1 hour, they will analyze results, compare with standards, and present their findings, highlighting the role of each technique in assessing Kushta quality.
Experiential Learning Activity
Experiential-Learning Learning 18.1: In-house Quality control section as per Schedule-T
(Total duration of Activity: 4 hours) 1. In this experiential learning activity, students will act as a task force assigned to develop an in-house Quality Control (QC) section in alignment with Schedule-T guidelines. The session will begin with a guided exploration of an external QC lab, either through a physical visit or an interactive virtual tour (1 hour). 2. Students will analyze the lab's infrastructure, documentation system, and standard operating procedures (1 hour). 3. They will then collaborate in groups to draft a blueprint for their own QC section, identifying essential equipment, personnel roles, and workflow design (1 hour). 4. Finally, each group will present their proposed QC setup, justifying their choices based on regulatory compliance and efficiency (1 hour).

Experiential-Learning Learning 18.2: Analytical lab as per PART XVI (A) of Drugs Rules, 1945
(Total duration of Activity: 4 hours) 1. Students, under the guidance of teachers, will simulate the process of establishing an analytical lab as per Part XVI (A) of the Drugs Rules, 1945. They will research regulatory requirements, necessary instruments, and infrastructure using online resources, including government websites and virtual lab tours/ physical visits (1 hour). 2. Divided into teams, they will draft a lab blueprint, detailing layout, equipment placement, and workflow, followed by a group discussion to refine their plan (1 hour). 3. Each team will then present their proposed lab setup, justifying their choices based on compliance, efficiency, and cost-effectiveness (1 hour 30 minutes). 4. The session concludes with a critical review by teachers, enhancing students' regulatory understanding (30 minutes).
Experiential-Learning Learning 18.3: Sample of Kushta
(Total duration of Activity: 5 hours) 1. Students will begin by examining Kushta sample using sensory evaluation, discussing texture, color, and odor under the teacher’s guidance. They will compare observations with classical descriptions from Unani texts (1 hour). 2. Next, they will critically analyze the formulation process, identifying possible variations in ingredients or methods that could affect quality. Engaging in peer discussions, students will hypothesize about the sample’s authenticity and potential deviations. Teachers will facilitate reflection on historical and modern quality assessment methods (2 hour). 3.The session concludes with students presenting their findings, debating their reasoning, and receiving feedback to refine their analytical thinking in Ilmul Saidla (2 hour).
Modular Assessment

Assessment	**Hour**

Instructions- Conduct a structured Modular assessment. The assessment will be for 25 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6 C. Viva Voce (25 Marks) • Understanding of Concepts – 5 Marks • Communication & Justification of Answers – 10 Marks • Application & Critical Thinking – 5 Marks • Response to Questions & Presence of Mind – 5 Marks Or Practical Assessments (Hands-on preparation and demonstration) (25 marks) • Practical Execution & Skills - 10 Marks • Observation, Analysis & Interpretation - 10 Marks • Report & Presentation - 5 Marks Or Field /Lab report evaluation (25 Marks) OrAny practical in converted form can be taken for assessment. (25 Marks) Or Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	2

Paper No : 3(EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)

Semester No : 3

Module 19 : General Considerations in Experimental Pharmacology تجرباتی علم الادویہ کے عمومی نکات

Module Learning Objectives

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

1. Evaluate the Core Concepts of Experimental Pharmacology

2. Illustrate Use and Care of Laboratory Animals

3. Apply Practical Skills in Drug Administration and Biological Sample Collection

4. Describe Ethical Practices and Regulatory Guidelines in Animal Experimentation

5. Examine Factors Influencing Drug Responses in Animal Models

Unit 1 Basics of Experimental Pharmacology تجرباتی علم الادویہ کا ساسی علم

19.1.1. The historical background, and development

19.1.2. Introduction

19.1.3. Drug Development and use of Animals

19.1.4. Commonly used experimental Animals

19.1.5. Animal Care, Handling and Sex Determination

19.1.6. Factors affecting drug responses in experimental animals

References: 207,208,213,216,236

3A	3B	3C	3D	3E	3F	3G
CO8	Describe the historical context and foundational principles of animal use in drug development and experimental pharmacology, recognizing the common	3	Lecture	CC	Knows-how	L&PPT ,L

	experimental animal models, their basic care, and key factors influencing drug responses.					
CO8	Analyze the scope of animal research in Unani medicine	6	Practical19.1	CAN	Shows-how	PER,RP,BS
CO8	Design a hypothetical experimental study using animal models, integrating knowledge of historical context, common animal behaviours.	10	Experiential-Learning19.1	CAN	Does	PER,SDL,PrBL

Unit 2 Dosing and Sampling of experimental animals تجرباتی حیوانات کو خوراک دینا اور نمونے جمع کرنا

19.2.1. Dose calculation for experimental animals

19.2.2. Routes of drug administration in laboratory animals

19.2.3. Techniques of blood collection in laboratory animals

19.2.4. Anaesthetics used in experimental pharmacology

19.2.5. Euthanasia methods used in experimental pharmacology

References: 207,215,226,227,228

3A	3B	3C	3D	3E	3F	3G
CO8	Describe the principles and proper application of essential experimental pharmacology techniques, including dose calculation, various routes of drug administration, methods of blood collection, and the selection of appropriate anaesthetics and euthanasia methods for laboratory animals.	4	Lecture	CC	Knows-how	L&PPT ,L_VC
CO8	Calculate drug dosages, identify appropriate routes of administration, demonstrating basic blood collection techniques, recognizing different	6	Practical19.2	PSY-MEC	Shows-how	D,SIM,PER,PSM

	anaesthetics, and understanding humane euthanasia methods for experimental animals, all while adhering to ethical practices.					
CO8	Apply dose calculation principles, critically evaluate drug administration routes, troubleshoot procedural challenges, understand anaesthetic impacts, formulate ethical justifications for euthanasia, and analyze factors affecting drug responses to mitigate variability in simulated experimental scenarios.	10	Experiential-Learning19.2	CAN	Does	BS,PER,JC,SIM,DIS

Unit 3 Ethical considerations for experimental animals تجرباتی حیوانات کے لیے اخلاقی پہلو

19.3.1. Introduction to The Prevention of Cruelty to Animals Act, 1960

19.3.2. Introduction to Cruelity Helsinki declaration

19.3.3. OECD (Organisation for Economic Co-operation and Development) guidelines for experimental animals

19.3.4. The Committee for the Purpose of Control and Supervision of Experiments on Animals (CCSEA) and Institutional Animal Ethics Committee (IAEC)

19.3.5. ICMR Guidelines

References: 202,205,207,214,215,224,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the foundational legal, ethical, and regulatory frameworks, including key acts, declarations, guidelines (e.g., PCA Act, OECD, ICMR), and institutional oversight bodies (e.g., CPCSEA, IAEC), that govern the ethical use of animals in experimental pharmacology.	3	Lecture	CC	Knows-how	L,L&PPT
CO1,CO3, CO4,CO8	Describe the roles and responsibilities of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) and the Institutional Animal Ethics Committee (IAEC) in ensuring ethical animal research.	8	Practical19.3	PSY-GUD	Shows-how	DL,D,PER

CO8	Analyze and apply the major legal, ethical, and regulatory guidelines (e.g., PCA Act, OECD, ICMR, Helsinki Declaration, and principles of CPCSEA/IAEC) to evaluate and propose ethical solutions for animal experimentation protocols.	6	Experiential-Learning19.3	CAN	Shows-how	PAL,JC,PER,RLE,PrBL

Practical Training Activity

Practical Training 19.1 Practical Aspects of Animal Use in Research

(Total duration of Activity: 6 hours)

The teacher will guide the students in searching classical and published literature on the scope of animals used in Unani research.(2hour)

The students will do a group discussion, and each student will prepare and do a presentation on the same. (4 hours)

or

The teacher will instruct the students to work in groups to research, identify, describe, demonstrate, discuss and summarise the historical background, common behaviours, sex determination, and humane handling techniques for an assigned experimental animal, preparing a short presentation for the class. (2 hours)

Student will collaborate to research their assigned animal, collect information on its historical use, behaviours, sex determination, and handling, then present their findings to the class, demonstrating their understanding of practical aspects of animal research. (4 hours)

Practical Training 19.2 Basic skills for working with experimental animals, in a simulated environment

(Total duration of Activity: 6 hours)

The teacher will provide various hypothetical experimental scenarios, including animal weights, drug concentrations, and desired doses. He also gives instructions about Simulated Blood Collection Techniques and about the methods of Anaesthetics and Euthanasia. (1.5 hours).

Students will be given worksheets with multiple scenarios to calculate drug doses. The students will verbally explain and justify their chosen route of administration for each scenario. Students will practice handling simulated syringes and needles on models, demonstrating the correct technique for different administration routes (without actual drug). Students will practice blood collection techniques on anatomical models (e.g., tail vein, retro-orbital) using mock blood and syringes/capillary tubes. For Anaesthetics and Euthanasia Methods, students will engage in group discussions on the pros and cons of different anaesthetics and

euthanasia methods. Students will answer theoretical questions and participate in short quizzes related to anaesthetic monitoring and confirmation of death. (4.5 hours)
Practical Training 19.3 Simulating Ethical Oversight: Understanding CPCSEA and IAEC in Practice
(Total duration of Activity:8 hours) 1. The teacher will explain the importance of Animal ethical committees for experimental animals and arrange a visit to nearby animal house.(1.5 hour) Student will give a presentation on CPCSEA and IAEC guidleines followed by group discussion and will submit and/ or present a report about the visit (3 hours) 2. Teacher will tell about the members of Animal Ethical Committee and their roles. (30 min) Student will arrange a simulated animal ethical committee under supervision of the teacher and present atleast 02 cases or proposals. Every student plays specific role in the committee. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 19.1: Virtual Animal Research Ethics and Application Simulation
(Total duration of Activity:10 hours) 1. Teacher will instruct students to engage with a virtual simulation platform to explore the historical context of animal use in drug development, identify commonly used experimental animals and their behaviours, practice humane handling techniquesand apply ethical principles (3Rs) in a simulated experimental in a simulated experimental design scenario. (2 hours) 2. Students will navigate the virtual simulation, interacting with modules on historical milestones, animal characteristics, and ethical guidelines, ultimately designing a hypothetical experiment while demonstrating proper animal care and adhering to the 3Rs principles within the simulated environment. (8 hours)
Experiential-Learning Learning 19.2: Experimental Design and Ethical Case Studies in Animal Research
(Total duration of Activity 10 hours) Teachers will guide students through two main activities.

1. Teacher will explain a detailed case study of a hypothetical drug development project which include information on the drug's properties, target disease, animal models used, and unexpected challenges encountered during administration. (1 hour)

Students will analyze provided data (graphs, tables, text descriptions) from a hypothetical drug development project and brainstorm potential reasons for observed drug administration challenges and variable drug responses. Students will present their findings and justifying their decisions based on scientific principles and considering factors affecting drug responses. (4 hours)

2. Teacher will provide several complex ethical dilemmas related to animal research, specifically focusing on dose related studies, chronic drug administration, and the decision-making process for euthanasia in compromised animals.(1hour)

Student will do group discussions to analyze and debate ethical dilemmas and present a reasoned ethical justification for their chosen course of action in response to the dilemma, referencing ethical guidelines and animal welfare principles. (4 hours).

Experiential-Learning Learning 19.3: Moot Institutional Animal Ethics Committee (IAEC) Meeting & Protocol Review

Total Duration - 06 hours

Teacher will facilitate a "simulated IAEC Meeting" by assigning roles to the students, providing a flawed hypothetical research protocol for review, and guiding students to critically evaluate it against ethical guidelines and regulatory frameworks. Teacher will assess the perfomance of student and conclude the meeting. [02 hours]

Students will actively participate in a simulated IAEC meeting by reviewing a research protocol from an assigned role's perspective, identifying ethical and regulatory concerns, debating proposed solutions, and making recommendations based on the learned guidelines. [04 hours]

Modular Assessment

Assessment	**Hour**
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C.	4

1. Practical work: 15 2. Project work: 25 3. LAQ: 1 Question (from any unit): 10 Or Scholarly essay critically analyzing the historical evolution of animal use in drug development. (50 Marks) Or Experimental Animal Welfare & Handling Protocol Design for the housing, care, and daily handling of a specific experimental animal species (50 Marks) Or Report writing on ethical considerations for 2-3 commonly used anaesthetics and euthanasia methods in experimental animals (50 Marks) Or Research Project Proposal on animal studies with IAEC/CPCSEA Justification (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Module 20 : General Introduction to Pharmacognosy علم وصف العقاقیر کا عمومی تعارف

Module Learning Objectives

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

1. Discuss the Historical Development and Fundamentals of Pharmacognosy
2. Classify Crude Drugs and Apply Principles of Plant Nomenclature and Taxonomy

3. Analyze Drug Interactions, Adverse Effects, and Issues of Adulteration in Unani Drugs
4. Develop Practical Skills in Medicinal Plant Identification and Evaluation
5. Apply Modern Techniques for Phytochemical Analysis and Study Key Plant Families

Unit 1 Basics of Pharmacognosy علم وصف العقاقیر کا اساسی علم

20.1.1. History, definition and scope of pharmacognosy

20.1.2. Historical development of pharmacognosy in Unani System of Medicine

20.1.3. Classification of crude drugs.

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO8	Describe the scope and practice of pharmacognosy in Unani medicine, source of Unani drugs and classification of organized and un-organized drugs used in Unani medicine	3	Lecture	CC	Knows-how	L&PPT ,L
CO1,CO4, CO8	Accurately examine, classify, and systematically document crude drugs using both modern morphological/chemical methods and classical Unani systems, thereby demonstrating enhanced observational and analytical skills essential for authenticating and differentiating Unani drugs.	5	Practical20.1	PSY-GUD	Shows-how	DG,D,PER
CO3,CO4, CO8	Construct a comprehensive understanding of the historical evolution and foundational principles of pharmacognosy in both general and Unani contexts, enabling them to critically apply various classification systems to new drug discoveries.	7	Experiential-Learning20.1	CS	Does	DG,D,FV

Unit 2 Applied Pharmacognosy عملی علم وصف العقاقیر

20.2.1. Introduction and importance

20.2.2. Adulteration and substitutes of Unani drugs

20.2.3. Factors affecting the quality of Unani drugs

20.2.4. Commerce and production of Unani crude drugs

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO8	Analyze the factors influencing the quality and safety of Unani crude drugs, including potential adulteration, drug interactions, and adverse effects, thereby proposing strategies for ensuring quality control and safe utilization within the context of Unani pharmaceutical commerce and production.	3	Lecture	CAN	Knows-how	L&PPT ,L
CO1,CO4, CO8	Identify and assess the quality of Unani crude drugs, demonstrating proficiency in detecting adulteration, evaluating factors affecting drug quality, and recognizing pharmacological activity.	5	Practical20.2	PSY-GUD	Shows-how	DL,DIS,PER
CO3,CO4, CO8	Evaluate the multifaceted factors (from cultivation to commerce) that influence the quality of Unani drugs, enabling them to develop practical strategies for optimizing production, preventing degradation, and ensuring the authenticity of raw materials in the Unani pharmaceutical industry.	7	Experiential-Learning20.2	CE	Does	TBL,FV,PER

Unit 3 Plant kingdom and nomenclature نباتات کی اقسام اور اسم بندی

20.3.1. Plant kingdom and classification

20.3.2. Introduction, objectives, importance and application of taxonomy in pharmacognosy

20.3.3. Plant nomenclature: principles and importance

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the hierarchical organization of the Plant Kingdom, explain the fundamental principles and importance of plant taxonomy, and recognize the role of botanical nomenclature in systematically classifying.	2	Lecture	CC	Knows-how	L&PPT ,L,L&GD
CO1,CO4, CO8	Apply taxonomic principles to identify and classify diverse plant specimens, and correlate this taxonomic understanding with its practical applications in pharmacognosy, demonstrating its objectives and importance in drug discovery and quality control.	4	Practical20.3	PSY-GUD	Shows-how	D,FV,PER,DIS,DL
CO1,CO4, CO8	Classify and identify selected medicinal plant using established taxonomic and nomenclatural principles, and propose their potential utility or challenges in pharmacognostic applications based on their taxonomic placement.	6	Experiential-Learning20.3	CE	Does	DG,FV,PER

Unit 4 Taxonomical features of medicinally important families طبی نباتی خاندانوں کی درجہ بندی کی خصوصیات

20.4.1. Apocynaceae, Asteraceae/Compositeae, Euphorbiaceae, Lamiaceae, Fabaceae (Leguminosae), Liliaceae, Malvaceae, Papaveraceae, Solanaecae, Umbellifercae.

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO8	Describe the significant medicinal, economic and ecological importance of plants	1	Lecture	CAP	Knows-how	PrBL,L&PPT ,L_VC,TBL

CO1,CO4, CO8	Identify plant families, their characteristic morphological features, understand their systematic classification, and recognize their significant economic and ecological importance.	1	Lecture	CC	Knows-how	SDL,L&PPT ,L,JC
CO1,CO4, CO8	Identify and differentiate between selected medicinal plant families based on morphological and floral characteristics.	6	Practical20.4	PSY-MEC	Shows-how	PrBL,PER,FV,D
CO1,CO3, CO8	Develop observational skills and taxonomic reasoning to correlate taxonomical features with medicinal usage, thus fostering a deeper understanding of plant classification.	6	Experiential-Learning20.4	CE	Does	PER,DIS,DL

Practical Training Activity

Practical Training 20.1 Comprehensive Crude Drug identification and classification

(Total duration of Activity : 5 hours)

The teacher will prepare 6-10 labeled crude drug specimens of different families, explain and demonstrate systematic examination techniques, and methods of identification of crude drugs. The teacher will guide students in applying method of identification and multiple classification systems like family, temperament-based classification, action-based classification etc., provide hands-on support for specimen handling, monitor classification accuracy, and encourage peer consultation. (1 hour)

Students will examine and identify crude drug specimens by systematically using provided tools. They will apply a structural classification system for morphological categorization, followed by a family-based classification, chemical constituent-based classification, temperament-based classification, and action-based classification. Finally, they will document their findings in classification matrices, providing justifications for their categorizations and submit it to the teacher. (4 hours)

Practical Training 20.2 Identification, adulteration, substitution and pharmacological activity of Unani crude drugs.

(Total duration of Activity: 5hours) 1. The teacher will brief students on cell differentiation and its diagnostic role in plant identification. The teacher shows prepared slides of leaf and stem containing key tissues. (45 min) The student will prepare and observes the slides, labels the tissues (epidermis, xylem, parenchyma), and sketches the structures. (1 hour 15 min) 2. Teacher will select 05 drugs for morphological identification and adulterants and introduce them to the students. The teacher will arrange a visit to the local market of herbal drugs. (30 min). Students will note down the characters of introduced drugs and visit the local market to identfy the true drugs and their adulterants. (1 hour) 3. Teacher will arrange the references to study the substitution and pharmacological activity of 5-10 Unani crude drugs. (30 min) The student will prepare a chart showing substitution and pharmacological activity of selected drugs with references (1 hour)
Practical Training 20.3 Taxonomic characters of medicinal plants used in Unani medicine
(Total duration of Activity : 4 hours) 1. The teacher will introduce the key taxonomic characters used for identifying medicinal plants in Unani medicine, such as plant family, genus, and species. They will demonstrate how to observe and analyze these characteristics in plants. (1 hours) 2. Students will examine medicinal plants, identifying them based on their taxonomic characters, such as leaf structure, flower arrangement, and stem type. They will document and compare their findings with reference materials for accurate identification. They will submit the findings in the form of practical file (3 hours)
Practical Training 20.4 Morphological and Anatomical Study of Medicinally Important Plant Families
(Total duration of Activity :6 hours) Teacher will provide list of the 06 plant families and their key taxonomical features (e.g., floral formula, inflorescence type, fruit type) to the students, arrange fresh or preserved plant specimens (e.g., leaves, flowers, fruits) and/ or herbarium sheets for each family and distribute a manual with diagrams and identification keys for each family. Teacher explains the taxonomical features of the families, focusing on diagnostic characteristics and demonstrate how to dissect a flower and prepare a temporary slide for microscopic observation. (1.5 hour)

Students will examine medicinal plants macroscopically, and microscopely. Identify the key features according to their plant families and prepare temporary slides of leaf or stem sections. Document observations, including floral formulae and diagnostic traits. Compare findings with identification keys in the manual. (4.5 hours)
Experiential Learning Activity
Experiential-Learning Learning 20.1: Unani pharmacognosy through time
(Total duration of Activity : 7 hours) Teacher will introduce the classical text of pharmacognosy like *Kitab al-Hasha'ish* by Dioscorides, *Al-Qanoon fi al-Tibb* by Ibn Sina, *Kitab al-Jami li-Mufradat al-Adwiya wa al-Aghdhiya* by Ibn al-Baytar, *Khazainul Advia* or relevant classical Unani texts. Focus on sections describing drug identification, collection, and classification. Teacher will also explain about the modern pharmacognosy textbooks discussing definitions, scope, and general classification systems. Provide guiding questions for individual reflection: "What were the primary concerns of the early Unani hakims when dealing with drugs?" "How did they describe and differentiate plants?" "What does this tell us about the early scope of pharmacognosy?" (2 hours)Students will individually read the classical and modern text and document their observations about identification and classification. Prepare chart of traditional Unani classification parameters (*Mizaj*, *Af'al*, Origin, Morphology as described in classical texts) and modern and general classification systems (morphological, taxonomical, chemical, pharmacological), and highlight the scientific advancements. Student also prepare a comparative chart showing identification methods of five or more drugs through ancient or traditional and modern references. Students will present their findings through power point presentation. (5 hours)
Experiential-Learning Learning 20.2: Farm to Pharmacy: The quality control of Unani Drug
(Total duration of Activity : 7 hours) The teacher will explain the factors affecting quality of herbal drugs during cultivation, collection, storage, and transport. Teacher will arrange a visit to herbal drug farm to inspect live sample and supply chain management to assure the quality of drugs. (1 hour)

Students will work in teams to navigate simulated stages of Unani crude drug production. They will analyze case studies detailing issues like incorrect harvesting, improper storage, or transportation challenges impacting drug quality. They will examine physical samples of crude drugs, identifying signs of degradation, pest infestation, or adulteration. students will document their findings and submit a detailed report of the visit. (6 hour)
Experiential-Learning Learning 20.3: Visit to the herbal garden
(Total duration of Activity: 6 hours) The teacher will lead students through the botanical garden or herb garden. The teacher highlights significant medicinal plants, explains their classification, characteristics, and uses. The teacher will encourage real-time identification using taxonomic keys and instructs students to select 5–8 medicinal plants from their field visit. The teacher will provide guidance on how to write concise reports, including plant identification, classification, temperament, and therapeutic uses. (1 hour 30 min) Students will walk through the garden, observe plant species in their natural environment, and identify selected medicinal plants using morphological features and taxonomic keys. They will record plant names, common names, taxonomic data, medicinal uses, and classification. Students will take photographs and make notes on each plant observed. Student will present their reports and findings through power point presentation. (4 hours 30 min)
Experiential-Learning Learning 20.4: Field-Based Exploration of Medicinally Important Plant Families.
(Total duration of Activity :6 hours) Teacher will organise a field visit to botanical garden, or natural habitat where plants from the listed families are available and explain students how to identify plants based on taxonomical features. Teacher will provide the images, taxonomical features, and medicinal uses of plants from each selected family to the students (1 hour). Students will do the field visit identify the plant, take photographs, collect the samples, and document their findings. Students will cross verifies the identification and taxonomical features of the collected sample by reference material. He/ she compile their observation and present their findings through power point presentation. (5 hours).
Modular Assessment

Assessment	Hour
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. Practical work: 15 Field report evaluation: 15 SAQ: 4 Questions (1 from each unit) 20 Or Preparation of Annotated Bibliography on a Contemporary Topic (50 Marks) Or Design a research proposal outlining a methodology to address the problem related to the drugs Or Applied Problem-Solving Scenario / Case Study Analysis (50 Marks) Or Macroscopic or Microscopic identification of crude drugs. (25 Marks) and A presentation on herbs and their adulterants. (25 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4
Semester No : 4	

Module 21 : Laboratory Animals used in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے تجرباتی جانور

Module Learning Objectives

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

1.Describe the core principles of experimental pharmacology, drug action, and preclinical study design.

2.Apply ethical standards, including the 3Rs, in the handling and welfare of laboratory animals.

3.Identify and utilize various animal models—rodent, non-rodent, and invertebrate—for pharmacological research.

Unit 1 Laboratory Animal Experimentation تجرباتی حیوانات پر مطالعے

21.1.1. Principles and Fundamentals of Experimental Pharmacology

21.1.2. Principles of drug action (Pharmacokinetics and Pharmacodynamics), Role of Preclinical studies in Drug development, and Types of Pharmacological Experiments (in vivo, in vitro, ex vivo)

21.1.3. The 3Rs principle (Replacement, Reduction, Refinement)

21.1.4. Animal Welfare: Animal housing and husbandry (environmental conditions, nutrition)

21.1.5. Animal health and disease management

21.1.6. Stress and pain management in laboratory animals

References: 206,207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO3,CO4, CO8	Describe the fundamental principles of experimental pharmacology, describe the basic concepts of drug action (pharmacokinetics and pharmacodynamics) and the role of preclinical studies in drug development, and articulate the comprehensive ethical framework governing laboratory animal experimentation, including the 3Rs principle, animal welfare practices, and stress and pain management.	3	Lecture	CC	Knows-how	L,L_VC,L&PPT

CO1,CO4, CO5,CO8	Identify optimal and sub-optimal welfare conditions, recognize signs of stress, pain, or disease in common laboratory animals, and propose evidence-based strategies for their management and improvement, demonstrating adherence to ethical animal welfare principles relevant to preclinical research.	5	Practical21.1	PSY-GUD	Shows-how	D,FV,SIM,PER,DL
CO1,CO3, CO4,CO8	Apply the fundamental principles of experimental pharmacology, pharmacokinetics, pharmacodynamics, and the 3Rs (Replacement, Reduction, Refinement) to design and critically evaluate appropriate *in vivo*, *in vitro*, and *ex vivo* experimental strategies for investigating the pharmacological potential and safety of Unani formulations.	7	Experiential-Learning21.1	PSY-ADT	Does	D,PER,SIM,D-M,DIS

Unit 2 Rodent Models: Mice, Rats and Guinea pig, Hamster روڈینٹ ماڈلز: چوہے، مائس، گنی پگ، ہیمسٹر

21.2.1. Rodents as Experimental animals

21.2.2. Common strains, biological characteristics, and behavior

21.2.3. Handling, restraint, and administration techniques

21.2.4. Applications in various pharmacological studies

References: 206,207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4	Describe the rationale for utilizing common rodent models (mice, rats, guinea pigs, and hamsters) in experimental pharmacology, identify their key biological characteristics and behaviors, explain the principles of their humane handling, restraint, and various administration techniques, and discuss their diverse applications in pharmacological research.	3	Lecture	CC	Knows-how	L_VC,L&PPT ,L

CO1,CO4, CO5	Demonstrate safe and humane handling, restraint, and various administration techniques for common rodent models, and justify the selection and application of these techniques in conducting a range of pharmacological studies relevant to preclinical drug evaluation.	5	Practical21.2	PSY-GUD	Shows-how	DL,D-M,D,SIM
CO1,CO4, CO5,CO8	Identify the common strains, biological features, and typical behaviors of experimental rodents, and justify the selection of specific rodent models for various pharmacological studies based on their observed characteristics.	7	Experiential-Learning21.2	PSY-SET	Does	PER,D-M,SIM,DIS
Unit 3 Non-Rodent Models: Rabbits, Monkey, Dog, Cat نان-روڈینٹ ماڈلز: خرگوش، بندر، کتا، بلی 21.3.1. Non- Rodents as Experimental animals 21.3.2. Relevant physiological and anatomical features 21.3.3. Specific handling and experimental considerations 21.3.4. Applications in various pharmacological studies **References:** 206,207,214,215,224,226,227						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO1,CO3, CO8	Describe the specific physiological and anatomical features, critical handling techniques, and key experimental considerations for non-rodent animal models, and outline their diverse applications in various pharmacological studies.	2	Lecture	CC	Knows-how	L,L_VC,L&GD,L&PPT
CO1,CO3, CO4,CO8	Analyze the relevant physiological and anatomical features of non-rodent models (like Rabbits), explain their specific handling and experimental considerations, and justify their appropriate application in various pharmacological studies particularly in contexts relevant to Unani drug development	5	Practical21.3	PSY-GUD	Shows-how	D-M,DL,SIM,PER,D

CO1,CO3, CO4,CO8	Analyze the relevant physiological and anatomical features of non-rodent models (Rabbits, Monkey, Dog, Cat), compare their unique biological characteristics across species, and justify their suitability as experimental animals for specific research applications based on these features.	6	Experiential-Learning21.3	PSY-SET	Does	PER,D-M,FV,DL,SIM

Unit 4 Miscellaneous Models: Frog, Pigeon, Zebra fish, Chicken دیگر ماڈلز: مینڈک، کبوتر، زیبرا فش، مرغی

21.4.1. Relevant physiological and anatomical features

21.4.2. Specific handling and experimental considerations

21.4.3. Applications in various pharmacological studies

21.4.4. Invertebrates used in experimental Pharmacology with minimal ethical consideration and its Applications in various pharmacological studies. Fruit flies (*Drosophila melanogaster*), Brine Shrimp (*Artemia salina*) and Nematodes (*Caenorhabditis elegans*)

References: 206,207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4	Describe the relevant physiological and anatomical features, specific handling and experimental considerations, and diverse applications in pharmacological studies for various miscellaneous models, including vertebrates (Frog, Pigeon, Zebrafish, Chicken) and invertebrates (Fruit flies, Brine Shrimp, Nematodes), distinguishing the ethical considerations associated with their use in experimental pharmacology.	2	Lecture	CC	Knows-how	L_VC,L,L&PPT
CO1,CO3, CO4,CO8	Analyze the relevant physiological and anatomical features of miscellaneous experimental models (Frog, Pigeon, Zebrafish, Chicken), explain their specific handling and experimental considerations, and justify their appropriate application in various pharmacological studies, particularly in contexts relevant to Unani drug evaluation.	5	Practical21.4	PSY-GUD	Shows-how	DL,FV,D,D-M,PER

CO1,CO3, CO4,CO8	Analyse the biological features of Fruit flies (*Drosophila melanogaster*), Brine Shrimp (*Artemia salina*), and Nematodes (*Caenorhabditis elegans*), perform/interpret basic pharmacological assays using these models, and justify their application as ethically sound and cost-effective tools for preclinical screening of Unani formulations.	6	Experiential-Learning21.4	PSY-MEC	Does	D-M,DIS,FV,D,PER

Practical Training Activity

Practical Training 21.1 Comprehensive Assessment and Management of Laboratory Animal Welfare

(Total duration of Activity: 5 hours)

Teacher will briefly explain the SOP of animal house and importance of '3Rs' principle. The teacher will arrange a visit to animal house facility or conduct a simulated assessment of various laboratory animal housing conditions and animal behaviors to identify welfare concerns and formulate appropriate management strategies. The teacher will also arrange videos showing animal behaviour in different health conditions (Normal healthy behavior, Subtle signs of stress, signs of pain and disesae). (1 hour 30 min)

Students will observe simulated animal facility or animal house in real time scenarios and animal behaviors, document welfare issues, and collaboratively develop practical solutions for animal housing, health, and pain management and document details related to environmental parameters (temperature, humidity, light cycle, ventilation), cage cleanliness, bedding type, enrichment devices, food and water quality/accessibility. Students identify and meticulously record observed behaviours and physical signs, attempting to interpret them as normal, stressed, painful, or diseased. (3 hour 30 min)

Practical Training 21.2 Rodent Handling, Administration, and Experimental design for animal studies

(Total duration of Activity: 5 hours)

Teacher will introduce the characteristics of common rodent models (mice, rats) relevant to handling and administration and briefly review relevant anatomy for different administration routes. The teacher will also demonstrate proper and techniques for picking up, holding, and restraining mice and rats for various procedures (e.g., scruffing for mice, tail hold for rats, conical restrainers) common routes of drug administration using live animal in animal house (depends on

facility and ethical clearance) or high-quality animal dummies/models or simulators. Teacher emphasizes correct needle size selection, maximum permissible volumes, and post-administration observation. [Common routes of drug administrations: Oral Gavage: Correct insertion and delivery using a feeding needle. Intraperitoneal (IP): Proper angle and location of injection. Subcutaneous (SC): Correct skin tenting and injection technique. Intramuscular (IM): Discuss appropriate muscle groups and volume limits. Intravenous (IV - e.g., tail vein for rodents): Discuss the technique, challenges, and importance for specific studies]. (2 hours 30 min)Students will practice humane handling, restraint, and drug administration techniques on animal models, then collaborate in groups to design and present mini-experimental protocols justifying their choices for rodent models, administration routes, and handling strategies based on specific pharmacological study objectives. (2 hours 30 min)
Practical Training 21.3 Strategic Selection, Handling, and Experimental Design of Non-Rodent Models
(Total duration of Activity: 5hours) The teacher will introduce non rodent models (Rabbit, Monkey, Dog, Cat) with a concise overview of their general characteristics and describe its advantages in preclinical research compared to rodents, especially where rodent models fall short. The teacher will also demonstrate species-specific handling/administration via video, discussing experimental considerations, and illustrating their primary pharmacological applications through case studies. (1 hour 30 min) Students will analyse case studies of non-rodent models, then collaboratively design and justify their use for experimental protocols for specific pharmacological studies. Students will present their study design through power point presentation. (3 hour 30 min)
Practical Training 21.4 Physiology, Handling, and Pharmacological Applications of miscellaneous experimental models (Frog/ Pigeon / Zebrafish/ Chicken)
(Total duration of Activity: 5 hours) The teacher will briefly introduce miscellaneous models, emphasizing their unique advantages and roles complementing mammalian research, then provide an overview of frogs, pigeons, zebrafish, and chickens, their unique physiological and anatomical features, specific handling considerations and pharmacological applications. Teacher presents one or few previous experimental studies on these miscellaneous experimental models. (1 hour 30 min). Students will prepare a chart showing experimental use of miscellaneous experimental models (frogs, pigeons, zebrafish, and chickens) and present a hypothetical study design using these models for pharmacological studies. (3 hours 30 min)

Experiential Learning Activity
Experiential-Learning Learning 21.1: Preclinical Strategy Design for Unani Formulation
(Total duration of Activity: 7 hours) Teacher will explain the methodology for preclinical study design and presents a case of preclinical study. The teacher will introduce the polyherbal Unani formulation and asks students to design its preclinical investigation for efficacy, safety. and the 3Rs to ensure both scientific rigor and ethical animal use. (2 hours)Students will collaboratively develop detailed preclinical experimental protocols for the given Unani formulation, integrating principles of experimental pharmacology, drug action, safety and the 3Rs, and then critically present and evaluate these designs.(5 hours)
Experiential-Learning Learning 21.2: Rodent Model Characterization: Behavior, Biology, and Experimental Suitability
(Total duration of Activity: 7 hours) The teacher will introduce rodent model importance, behaviour and characteristics and arrange a visit to registered animal house to show live rodent models (under ethical guidelines) or video showcasing different common rodent strains in various standard housing and controlled experimental contexts. Guide students in developing and applying behavioral observation protocols using live or video models, and then facilitate data analysis and discussion to link observed behaviors to hypothetical pharmacological study scenarios (e.g., Investigating an anti-anxiety Unani formulation, or Evaluating a new Unani compound for metabolic disorders). (2 hours) Students will actively participate in hands-on practice sessions for rodent handling, restraint, and drug administration on training models, followed by group work to design experimental protocols incorporating these techniques for various pharmacological applications. They prepare to briefly present their design. (5 hours)
Experiential-Learning Learning 21.3: Non-Rodent Experimental Models: importance, Anatomy and Physiological Relevance.
(Total duration of Activity: 6 hours)

The teacher will explain the importance of non-rodent animals used in experimental pharmacology with few examples and do comparative analysis of the relevant physiological and anatomical features of non-rodent models (Rabbits, Monkeys, Dogs, Cats) to understand their unique suitability as experimental animals for specific research applications. Teacher also present the few related previous studies. (2 hours) Students will prepare a comparative chart of the relevant physiological and anatomical features of non-rodent models (Rabbits, Monkeys, Dogs, Cats) and design a protocol for a Unani formulation using suitable non rodent model with ethical consideration and suitable justification. Students present their work through power point presentation or submit it as an assignment. (4 hours)
Experiential-Learning Learning 21.4: Ethically conscious preclinical screening of Invertebrate models in pharmacology.
(Total duration of Activity: 6 hours) 1. The teacher will briefly introduce invertebrate models, highlighting their advantages like cost-effectiveness, rapid life cycles, genetic tractability, physiological simplicity, and minimal ethical consideration. Briefly overview the biology and pharmacological contributions of Fruit flies (*Drosophila melanogaster*), Brine Shrimp (*Artemia salina*), and Nematodes (*Caenorhabditis elegans*). If feasible, show live cultures (e.g., Drosophila vials, Artemia dishes, C. elegans plates) for direct observation (under microscopes where needed) or shows video clips demonstrating assays and handling techniques or arrange a field visit to nearby lab facility where such experiments are performed. (2 hours) 2. Students will perform a literature survey of last 05 years for invertebrate models showing, ethical consideration, handling, behaviour, and pharmacological applications and present it through power point presentation. (4 hours) Or Students may draw a chart depicting the invertebrate models, its biology, ethical consideration, and pharmacological assay alongwith hypothetical experimental design presentation (4 hours) Or Students will be divided in two groups; one group will perform literature survey and the other group will draw chart and do presentation. (4 hour)
Modular Assessment

Assessment	**Hour**

Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. 1. Practical work using dummy models and simulation methods (10 Marks) 2. Project work (10 Marks) 3. Field evaluation report of the Animal House visit (10 Marks) 4. SAQ: 4 Questions (1 from each unit) (20 Marks) Or Problem-Solving Scenarios/Case Studies (50 Marks) Or Hypothetical Experiment Design & Protocol Writing (50 Marks) Or hypothetical research proposal presentations for experimental animals (emphasizing ethical justification) (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Module 22 : Identification of crude drugs خام ادویہ کی شناخت

Module Learning Objectives

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

1. Demonstrate plant morphology, anatomy, and cell differentiation for accurate crude drug identification.
2. Identify the role of ergastic cell contents in distinguishing medicinal plant materials.

3. Develop practical skills in microscopical techniques and quantitative microscopy for drug analysis.
4. Apply physico-chemical and advanced analytical methods, including chromatography and spectrophotometry, for drug evaluation

Unit 1 Morphology and Anatomy of plants پودوں کی ساخت اور جسمانی بناوٹ

22.1.1. Introduction, and importance morphology and anatomy in plant identification

22.1.2. Subterranean organs, Stems and Barks

22.1.3. Leaves or leaflets

22.1.4. Inflorescences and Flowers

22.1.5. Fruits and seeds

22.1.6. Herbs

22.1.7. Unorganised drugs

References: 201,203,204,209,210,211,212,217,218,219,220,221,222,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the fundamental importance of plant morphology in identification and describe the distinctive macroscopic features of various organized plant parts (subterranean organs, barks, woods, leaves, inflorescences, flowers, fruits, and seeds) and unorganised crude drugs relevant to their identification in pharmacognosy.	3	Lecture	CC	Knows-how	L_VC,L&PPT ,L
CO1,CO3, CO4,CO8	Demonstrate the morphological characters of leaves, tops, leaflets, and bark of commonly used Unani medicinal plants using hand lens and L-Shaped scale Comprehensively analyze and characterize crude drugs using a systematic approach that integrates macroscopic and microscopic investigations for their accurate identification and quality control in Unani Medicine.	5	Practical22.1	PSY-GUD	Shows-how	DL,DA,PER,PT

CO1,CO3, CO4,CO8	Develop an understanding of the morphology and anatomy of various plant parts, including subterranean organs, barks, leaves, flowers, fruits, and seeds, as well as the significance of unorganized drugs in plant identification.	7	Experiential-Learning22.1	PSY-SET	Does	PER,D,FV,DL

Unit 2 Cell differentiation and ergastic cell content خلیوں کی تمیز اور ایرگاسٹک خلیاتی مواد

22.2.1. Importance in plant identification

22.2.2. Cell wall, Parenchymatous tissues, Epidermis and Epidermal trichomes

22.2.3. Endodermis, Cork tissue, Collenchyma, Sclereids, and Fibres

22.2.4. Xylem and Phloem

22.2.5. Secretory Tissues

22.2.6. Ergastic Cell contents

References: 201,203,204,209,210,211,212,217,218,219,220,221,222,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Classify and describe the diverse types of plant tissues and various ergastic cell contents, and explain their fundamental diagnostic importance in the microscopic identification of medicinal plants and crude drugs.	3	Lecture	CC	Knows-how	L&PPT ,L,L_VC
CO1,CO3, CO4,CO8	Perform microscopic examinations of plant tissues to distinguish between different cell types and structures. During the observation, will identify various ergastic cell contents such as volatile oils, gums and mucilage, resins, tannins, calcium oxalate etc.	5	Practical22.2	PSY-GUD	Shows-how	DL,D,PER,TPW,DIS

CO1,CO3, CO4,CO8	Analyse cell differentiation and ergastic substances contribute to the identification of plants, particularly in the analysis of crude drugs. Become familiar with key anatomical structures and recognize their distinctive features and functions.	7	Experiential-Learning22.2	PSY-ADT	Does	FV,DL,DG,PER

Unit 3 Microscopical techniques for Identification of crude drugs خوردبینی تکنیکیں برائے شناختِ خام ادویہ

22.3.1. Drug preparation for Microscopical examination and use of reagents

22.3.2. Identification of powdered drug: preliminary tests and microscopical examination

22.3.3. Quantitative Microscopy: Lycopodium spore method and Leaf examination

References: 201,203,204,209,210,211,212,217,218,219,220,221,222,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the principles and procedures involved in crude drug preparation for microscopical examination, the systematic approach to identifying powdered drugs through preliminary tests and detailed microscopical examination, and the techniques of quantitative microscopy including the Lycopodium spore method and leaf examination.	2	Lecture	CC	Knows-how	L&PPT ,L,L_VC
CO1,CO3, CO4,CO8	Demonstrate the preparation of powdered crude drugs for microscopical examination using appropriate mounting media and staining reagents, and perform quantitative microscopy by applying the Lycopodium spore method and measuring leaf constants such as stomatal number, vein-islet number, and palisade ratio, to support the standardization and quality control of crude drugs.	5	Practical22.3	PSY-GUD	Shows-how	DL,TBL,DA,PER,DIS
CO1,CO3, CO4,CO8	Perform powder drug analysis by conducting preliminary tests and microscopical examination to identify diagnostic features such as trichomes, starch grains,	6	Experiential-Learning22.3	PSY-ADT	Does	PER,DA,DL,D

	crystals, vessels, and fibers, enabling accurate identification and differentiation of crude drugs in powdered form.					

Unit 4 Physico-chemical investigations for identification of crude drugs خام ادویہ کی شناخت کے لیے طبعی و کیمیائی تجزیہ

22.4.1. Chemical tests for the identification of therapeutically active phytoconstituents: Alkaloids, Glycosides, Cardiac glycosides, Anthraquinone glycosides, Phenolic compounds, Flavonoids, Tannins, Saponins, Terpenoids, Steroids, Sugars, Carbohydrates, Fixed oils, and fats, Volatile oils, Saponins, Amino acids, Gums, and Mucilage.

22.4.2. Physical evaluation for the identification of crude drugs: Moisture content, Ash values (total, acid-insoluble, water-soluble, sulphated ash), Extractive values (water, alcohol, ether, chloroform), Solubility of drug in various solvents, Melting point, Boiling point, Specific gravity, Viscosity, Optical rotation, Refractive index, Fluorescence analysis, Fiber elasticity, Swelling factor, Foaming Index, Crude fibre content.

22.4.3. Chromatographic Techniques: Introduction and application of Chromatographic Techniques used in drug identification: Thin-Layer Chromatography (TLC), Column Chromatography, Paper Chromatography, High-Performance Liquid Chromatography (HPLC), High-Performance Thin Layer Chromatography (HPTLC), Gas Chromatography (GC), Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Ultra-High Performance Liquid Chromatography (UHPLC)

22.4.4. Spectrophotometric Methods: Introduction and application of Spectrophotometric methods used in drug identification: Ultraviolet-Visible (UV-Vis) Spectrophotometry, Infrared (IR) Spectrophotometry, Atomic Absorption Spectrophotometry (AAS), Atomic Emission Spectrophotometry (AES), Fluorescence Spectrophotometry

References: 201,203,204,209,210,211,212,217,218,219,220,221,222,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the principles and discuss the applications of various physico-chemical investigations, including chemical tests for phytoconstituents, physical evaluation	2	Lecture	CC	Knows-how	L_VC,L,L&PPT

	parameters, chromatographic techniques, and spectrophotometric methods, for the comprehensive identification and quality assessment of crude drugs.					
CO1,CO3, CO4,CO8	Perform chemical and physical evaluation techniques such as specific reagent-based tests for phytoconstituents and measurements like ash values, extractive values, moisture content, solubility, and physical constants to identify, authenticate, and assess the quality of crude drugs.	5	Practical22.4	PSY-GUD	Shows-how	DL,D,PER
CO1,CO4, CO8	Demonstrate the principles, instrumentation, and interpretative applications of chromatographic and spectrophotometric techniques including TLC, HPTLC, HPLC, GC, LC-MS, UV-Vis, IR, AAS, and Fluorescence spectroscopy, for the qualitative and quantitative evaluation of phytoconstituents in crude drug.	6	Experiential-Learning22.4	PSY-ADT	Does	DA,DL,PER,D,DIS

Practical Training Activity

Practical Training 22.1 Comparative Morphology and Anatomy of Leaves, Flowers, Fruits & Seeds

(Total duration of Activity: 5 hours)

.The teacher will prepare and set up diverse plant specimen stations, brief students on observation objectives, actively guide and facilitate their systematic morphological comparison. (30 min)

Students will rotate through stations with diverse plant specimens, systematically describing and comparing their morphological features (leaf types, venation, inflorescence types, floral structures), and documenting observations with drawings and notes. (1 hour 30 min)2. The teacher will introduce microscopy principles, demonstrate section preparation, prepare materials, guide students through microscopic examination and identification of key anatomical features in leaves, flowers, fruits and seeds, and consolidate learning on their diagnostic importance for drug quality control (1 hour)

Students will prepare and observe microscopic slides of leaves, flowers, fruit and seed sections, identify key anatomical features, and draw labeled diagrams of their observations. (2 hour)

Practical Training 22.2 Microscopic Observation and Identification of Cell Types and Ergastic Contents in Crude Drugs
(Total duration of Activity: 5 hours) Teacher will guide the students in preparing slides using available plant materials or crude drugs. Demonstrate staining techniques (e.g., iodine for starch, phloroglucinol-HCl for lignified tissues). Instruct students on how to identify key tissue structures and ergastic contents under a microscope. (2 hours) Students will prepare temporary mounts of plant tissues, stain and observe under microscope. They will draw labeled diagrams of observed structures, record findings in tabulated format, and classify the samples based on tissue types and ergastic contents. Students may be provided prepared slide for the same. (3 hours)
Practical Training 22.3 Quantitative Microscopy for Identification and Standardization of Crude Drugs
(Total duration of Activity: 5 hours) The teacher will begin by explaining the standard procedures for preparing powdered crude drugs for microscopical analysis and introduces the concept of quantitative microscopy. The teacher will also demonstrate Lycopodium spore method and /or Leaf examination on one or few Unani drugs. Students will be guided to perform these practical independently under supervision. (2 hours) Students will select powdered crude drug samples, perform staining using suitable reagents and mount the samples using glycerine or chloral hydrate. They will prepare clean slides, observe under the microscope, and note the appearance and behaviour of specific cell structures in response to the reagents or students may be provided prepared slides. For leaf examination, students will observe prepared or reference slides to identify parameters like stomatal number, vein-islet number by using microscopes. (3 hours)
Practical Training 22.4 Chemical and physical evaluation techniques for identification and quality assessment of crude drugs
(Total duration of Activity: 5 hours) The teacher will introduce the importance of physical and chemical evaluation in pharmacognosy and drug standardization. For chemical tests, the teacher will demonstrate the use of specific reagents for detecting alkaloids (e.g., Dragendorff's), tannins ($FeCl_3$), flavonoids, saponins, and proteins. In the physical

evaluation section, the teacher will guide students through estimation of ash values (total ash, acid-insoluble, water-soluble), extractive values in different solvents, moisture content, solubility tests, and measurement of physical constants like specific gravity, melting/boiling point, and swelling index. (2 hours) Students will perform chemical identification tests using appropriate reagents on powdered crude drug samples, record color changes or precipitate formation, and infer the presence of specific phytoconstituents. They will also conduct physical evaluations by measuring ash values, determining extractive values using different solvents, calculating moisture content, and evaluating solubility behaviour. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 22.1: Morphological and Anatomical Insights for Plant Identification
(Total duration of Activity: 7 hours) Teacher will present detailed explanations of different plant parts using images, herbarium specimens, and botanical diagrams. They will highlight the characteristics and importance of subterranean organs, barks, leaves, inflorescences, flowers, fruits, seeds, herbs, and unorganized drugs. (3 hours) Students will engage actively by observing real plant specimens or high-quality images representing various plant parts such as roots, stems, leaves, flowers, fruits, and seeds. Through careful examination, they will prepare accurate and detailed sketches to reinforce their understanding of the morphological characteristics of each part. Additionally, students will apply their knowledge to categorize the observed samples into organized drugs—those with distinct plant parts—and unorganized drugs, which lack defined structure, based on their morphological attributes. (4 hours)
Experiential-Learning Learning 22.2: Plant Tissue Differentiation and Ergastic Contents Through Visual and Comparative Study
(Total duration of Activity: 7 hours) The teacher will explain each tissue system and ergastic content using labeled plant cross-section images, microscopic slide visuals, and anatomical diagrams. They will guide students in identifying and distinguishing different cell types and structures through these visual aids. (3 hours) Students will observe diagrams and virtual slides of plant tissues, engage in creating comparative tables and present short summaries on how selected tissues contribute to plant function and drug identification. Students may also prepare flashcards highlighting features of ergastic cell contents. (4 hours)
Experiential-Learning Learning 22.3: Identification of Powdered Drug through Preliminary Tests and Microscopical Examination

(Total duration of Activity: 6 hours)

The teacher will explain the importance of preliminary tests in identifying powdered crude drugs through organoleptic properties like color, odor, taste (if permitted), texture, and solubility. The teacher will then introduce microscopical examination, guiding students to identify key diagnostic features using reference or prepared slides. (2 hours 30 minutes)

Students will begin by performing preliminary tests on powdered crude drugs to assess organoleptic properties and solubility in water or alcohol. They will then examine the same samples microscopically to identify key features like trichomes, crystals, starch grains, and vessels. (3 hours 30 minutes)

Experiential-Learning Learning 22.4: Application of Chromatographic and Spectrophotometric Techniques in Identification and Standardization of Crude Drugs.

(Total duration of Activity: 6 hours)

The teacher will explain the working principles of various chromatographic techniques such as Thin Layer Chromatography (TLC), Column Chromatography, and HPTLC, including mobile and stationary phases, Rf value calculation, and separation principles. Instrumentation overview for HPLC, GC, LC-MS etc will be presented via charts, videos, or instrument walkthroughs. Next, the teacher will introduce spectrophotometric methods including UV-Vis, IR, AAS, and Fluorescence Spectroscopy. (3 hours)

Students will observe TLC or HPTLC demonstrations, record Rf values, and match spots with standard phytoconstituents. They will interpret sample chromatograms from HPLC or LC-MS. For spectrophotometry, they will analyze UV-Vis and IR spectra of crude drugs, identify key peaks, and relate them to functional groups. Group discussions and worksheets will support interpretation and understanding of each technique's role in drug standardization. (3 hours)

Modular Assessment

Assessment	Hour
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. 1. Practical work (15 Marks)	4

2. Field report evaluation (15 Marks) 3. LAQ: 2 Questions (1 Question either from Unit 1 or 2 and 1 Question from Unit 4) (20 Marks) Or Integrated Laboratory Assessment with Viva Voce (50 Marks) Or Analytical Technique Proficiency Test (Hands-on or Simulated) (50 Marks) Or Problem-Solving & Case Study Examination (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Semester No : 5

Module 23 : In Vitro Experimental Studies and Alternative to Animal Experimentation ان وٹرو تجرباتی مطالعات اور حیوانات کے متبادل

Module Learning Objectives

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

1. Discuss in vitro experimental techniques and their role as alternatives to animal testing.
2. Demonstrate good laboratory practices, biomedical waste disposal, and tissue isolation and preparation methods.
3. Familiarize with experimental apparatus like organ baths and force transducers used in pharmacological studies.
4. Examine ethical frameworks, focusing on the 5 Rs of animal ethics and the evaluation of in vitro methods.
5. Apply modern alternatives such as computational modeling, microdosing, and physicochemical approaches.

Unit 1 Good Laboratory Practice (GLP) for Animal Experimentation (GLP) حیوانات پر تجربات کے لیے اعلیٰ تجرباتی مشق

23.1.1. Introduction and Documentation in GLP

23.1.2. SOPs of GLP

23.1.3. Need and importance of GLP

23.1.4. Terminologies used in experimental pharmacology and procedures

23.1.5. Duration of Animal Experimental studies

23.1.6. Biomedical Waste Management

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Discuss the principles and significance of Good Laboratory Practices (GLP), including documentation, Standard Operating Procedures (SOPs), essential terminologies in experimental pharmacology, the duration of animal studies, and biomedical waste management, to ensure ethical, accurate, and compliant laboratory research.	2	Lecture	CC	Knows-how	L&PPT ,L,L_VC
CO1,CO4, CO8	Apply Good Laboratory Practices (GLP) in experimental pharmacology through accurate documentation, adherence to SOPs, use of proper terminology, compliance with study duration, and safe biomedical waste handling.	3	Practical23.1	PSY-GUD	Shows-how	DL,SIM,PER,D,D-M
CO1,CO4, CO8	Apply GLP principles in animal experimentation, including proper terminology, study duration, and biomedical waste management.	7	Experiential-Learning23.1	PSY-ADT	Does	SIM,PER,DIS,D

Unit 2 Alternative to Animal Experimentation حیوانی تجربات کا متبادل

23.2.1. The 5 Rs of Animal ethics and advantages and disadvantages of *In Vitro* studies

23.2.2. *In Silico* or Computational studies

23.2.3. Observational Studies

23.2.4. Microdosing

23.2.5. *In Vitro* studies

23.2.6. Physicochemical methods

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the ethical principles in animal research (5 Rs), and explore alternative research methodologies such as in vitro, in silico, observational, microdosing, and physicochemical methods, along with their advantages and limitations.	2	Lecture	CAN	Knows-how	L&GD,L&PPT ,L_VC,C_L
CO1,CO3, CO4,CO8	Interpret and apply data from microdosing, *in vitro* studies, and physicochemical methods to evaluate their utility as alternatives to animal experimentation in drug development.	3	Practical23.2	PSY-GUD	Shows-how	TPW,DL,PER,DIS,D
CO1,CO3, CO4,CO8	Analyse and propose ethical, non-animal research strategies by applying the 5 Rs principles and evaluating the utility of *in vitro*, *in silico*, and observational study designs.	7	Experiential-Learning23.2	PSY-ADT	Does	DL,D,DIS,PER

Unit 3 Muscle Preparation عضلات کاری

23.3.1. Fast and slow contracting smooth muscle preparation

23.3.2. Cardiac Muscle Preparation

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G

CO1,CO3, CO4,CO8	Describe and differentiate the physiological and pharmacological characteristics of fast and slow contracting smooth muscle, cardiac muscle and their preparation methods, and their significance in drug testing and research.	1	Lecture	CC	Knows-how	L_VC,L,L&PPT
CO1,CO4, CO8	Demonstrate and differentiate the dissection and preparation techniques for fast and slow contracting smooth muscle, and cardiac muscle, for *in vitro* pharmacological studies.	7	Practical23.3	PSY-GUD	Shows-how	D-M,PER,DL

Unit 4 Apparatus used for studying isolated tissue/ muscles تیارشدہ عضلات وانسجہ کے مطالعہ کے لیے استعمال ہونے والے آلات

23.4.1. Organ Bath

23.4.2. Langendroff Apparatus

23.4.3. Wire Myographs

23.4.4. Force Transducers

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Analyze the operational principles and key experimental applications of both the Organ Bath and Langendorff Apparatus for studying isolated tissues and muscles in pharmacological and physiological research.	1	Lecture	CC	Knows-how	L&GD,L&PPT ,JC,L_VC
CO1,CO3, CO4,CO8	Describe the principles of operation and practical applications of Wire Myographs and Force Transducers in the study of isolated tissue/muscle mechanics relevant to pharmacological research.	1	Lecture	CC	Knows-how	FC,JC,L&GD,L&PPT
CO1,CO3, CO4,CO8	Demonstrate the functioning of Organ Bath and Langendorff Apparatus along with the methodology of studying the isolated tissue/ muscles.	4	Practical23.4	PSY-GUD	Shows-how	DL,D-M,PER,SIM

CO1,CO3, CO4,CO8	Independently set up, calibrate, and operate Wire Myographs and Force Transducers to measure isometric and isotonic contractions of isolated tissues, and analyze the resulting data in the context of Unani pharmacological principles.	6	Experiential-Learning23.3	PSY-ADT	Does	SIM,DL,PER,D

Unit 5 Isolation of tissue/muscle عضلات وانسجہ کی تیاری

23.5.1. Pharmacological importance and studies on isolated tissue/ muscle

23.5.2. Methods of isolation and preparation of tissue/ muscle Chicken ileum, Guinea Pig Mysentric plexus, Rat Ascending and Descending colon, Rat Uterus, Rat Stomach Fundus, Frog Rectus Abdominis Muscle, Rabbit Duodenum, Rabbit Aortic Strip, Rabbit Perfused ear artery

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the fundamental pharmacological importance and diverse applications of isolated tissue/muscle preparations in preclinical drug discovery and research, specifically identifying their advantages and limitations for investigating drug actions within the context of Unani medicine.	1	Lecture	CC	Knows-how	L&PPT ,L_VC,L&GD,JC
CO1,CO3, CO4,CO8	Describe the general principles and specific procedural steps for isolation, handling, and preparation of various animal tissues and muscles commonly used in pharmacological research .	1	Lecture	CC	Knows-how	L&PPT ,JC,L&GD,BS
CO1,CO3, CO4,CO8	Identify the suitable applications of various isolated tissue/muscle preparations for investigating specific pharmacological effects of Unani drugs, and correlate tissue-specific responses with pharmacodynamic principles for effective interpretation of drug effects in different isolated preparations.	1	Lecture	CAP	Knows-how	L_VC,L&PPT ,L&GD

CO1,CO3, CO4,CO8	Isolate and prepare various animal tissue/muscle specimens suitable for *in vitro* pharmacological studies, demonstrating proficiency in dissection techniques, tissue handling, and maintaining tissue viability.	3	Practical23.5	PSY-GUD	Shows-how	D-M,D,SIM,DL
CO1,CO3, CO4,CO8	Apply ethical reasoning, observational analysis, and critical thinking in understanding the use and relevance of isolated tissue preparations in Unani pharmacological research.	6	Experiential-Learning23.4	AFT-VAL	Does	PER,DL,SIM,D

Practical Training Activity

Practical Training 23.1 Hands-on GLP.

(Total duration of Activity: 3 hours)

Teacher will explain GLP, importance of documentation (laboratory notebooks) and SOP framing. Teacher will conduct a walkthrough to the lab for the assessment of GLP of that lab. (1 hour)

Students will document their observations and present through power point presentation and point out the shortcomings if present in the lab and give suggestion to in compliance of GLP. (2hours)

Practical Training 23.2 Exploring Non-Animal Alternatives: A Case Study & Data Interpretation Workshop.

(Total duration of Activity: 3 hours)

Teacher:

Teacher will introduce the concept of microdosing (e.g., a simplified diagram of a microdosing study flow), In-vitro assays (e.g., a cell culture plate, images of different cell types, a Western blot or ELISA plate diagram) and basic physicochemical instruments (e.g., a pH meter, spectrophotometer, HPLC machine). Then the teacher will instruct the students to prepare a fictional case study with mock data on microdosing, *in vitro*, and physicochemical methods, and guide students to interpret results, discuss advantages/limitations, and present findings in groups. (1hours)

Students will present the fictional case study then collaboratively analyze and interpret mock data from a fictional pre-clinical investigation spanning microdosing, *in vitro* assays, and physicochemical characterization to evaluate each method's contribution, advantages, limitations, and ethical implications as alternatives to animal experimentation. (2 hour)
Practical Training 23.3 Dissection and Preparation of Isolated Muscle Tissues.
(Total duration of Activity: 7 hours) Teacher will describe briefly about muscle preparation and its tools like dissection tools, physiological salt solutions, isolated organ baths, and recording equipment. Demonstrate step-by-step dissection and tissue handling for any one muscle type or illustrate the methods via simulation lab or through the videos (2 hours 30 min) Students will dissect, prepare, and mount fast/slow contracting smooth muscle and cardiac muscle tissues, documenting their work while differentiating specific handling techniques for each. **Record contractile responses and interpret graphs. Compare responses between smooth muscle and cardiac muscle. Maintain a lab record of observations and drug effects.** **Or student may present** dissection and preparation techniques for fast and slow contracting smooth muscle, and cardiac muscle, for *in vitro* pharmacological studies alongwith its pharmacological characteristics with examples from previous stidies. **(4hours 30 min).**
Practical Training 23.4 Functioning of Organ Bath and Langendorff Apparatus.
(Total duration of Activity: 4 hours) Teacher will Demonstrates components and setup of organ bath and Langendorff system, and explains their specific applications in pharmacological testing. Teacher will also demonstrate the functioning of both the instruments either live or through the videos (1 hour 30 min) Student will draw label diagrams of the Organ Bath and Langendorff apparatus and match components to their specific functions and write a brief study plan for Unani drugs using these apparatus. (2 hour 30 min)
Practical Training 23.5 Isolated Tissue/Muscle Preparation.
(Total duration of Activity: 3 hours)

Teacher will demonstrate the isolation technique (live or simulated through videos) for one or few tissues and shows anatomical landmarks for correct tissue identification. Explains ethical handling and proper disposal of animal remains. (1hours) Student will observe the isolation of different tissues. Maintain a laboratory record with diagrams and procedural notes. Student will make a chart depicting step-by-step of isolating the chosen tissue (2hours)
Experiential Learning Activity
Experiential-Learning Learning 23.1: Simulated Pre-clinical Study: From Protocol to Waste Disposal.
(Total duration of Activity: 7 hours) Teacher will briefly explain the one or few experimental pharmacology procedures (like analgesic studies/ anti-inflammatory studies/ behavioural studies) and its duration. He/ She will also describe Biomedical Waste Management in short. The teacher will also arrange demonstration of pharmacological equipment with proper SOP or depict them through videos. Further he/ she will instruct student to design a Simulated Pre-clinical study which includes, study title & objectives, brief methodology, equipment used, ethical considerations, anticipated timeline, and waste management system. (2 hours) Students will simulate a pre-clinical animal study, encompassing protocol comprehension, meticulous notebook documentation, SOP preparation, equipment identification, terminology application, timeline analysis, and practical biomedical waste management. (5 hours)
Experiential-Learning Learning 23.2: Designing Ethical Research: A Multi-Modal Alternative Approach.
(Total duration of Activity: 7 hours) Teacher will give comprehensive lecture/discussion on the ethical imperative for alternatives and introduce the "5 Rs" with practical examples and a brief overviews / definition of *in vitro*, *in silico*, and observational study methodologies. He/ she will also present a previous study on such scenario. Teacher will instruct student to design a Research Proposal focusing exclusively on non-animal alternatives as well. (2 hours) Students will analyze fictional research scenarios and apply the 5 Rs of animal ethics to design conceptual proposals using in vitro, in silico, and observational study methods. They'll identify each method's advantages and disadvantages, then present and discuss their alternative research strategies. (5 hours)
Experiential-Learning Learning 23.3: Functioning of Wire Myographs and Force Transducers .

(Total duration of Activity: 6 hours) Teacher will briefly explain the instruments and its application. He/She will also arrange a virtual simulations or videos showing experiments using Wire Myographs and Force Transducers. The teacher will also present the previous studies on the same. (1 hour 30 min) Student will draw label diagrams of the Wire Myographs and Force Transducers and match components to their specific functions and write and present a brief study plan for Unani drugs using these apparatus. (4 hours 30 min)	
Experiential-Learning Learning 23.4: Isolated Tissue/Muscle Preparation: Ethical consideration and Pharmacological importance.	
(Total duration of Activity: 6 hours) Teacher will presents case scenarios on choosing appropriate tissue for specific drug testing. Leads a discussion on ethical considerations in tissue isolation from animals. He/ She will also shares recorded real-lab procedures or virtual models (1 hour 30 min) Student will participate in a virtual tissue preparation simulation or watch procedural videos, discuss the ethical use of animal tissues. Student will also prepare a comparison chart of various tissue types their pharmacological applications and ethical consideration. Create a graphical abstract on different tissue's isolation method and its relevance. (4 hours 30 min)	
Modular Assessment	
Assessment	**Hour**
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. 1. Practical work (15 Marks) 2. Project work (10 Marks) 3. SAQ: 5 Questions (1 from each unit) (25 Marks) Or	4

Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Module 24 : Bioassay and Toxicity studies حیاتی تعین ومطالعہ سمیت

Module Learning Objectives

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

1. Describe the principles, methodologies, and applications of bioassays in pharmacology.
2. Analyze drug response relationships and sources of error in bioassay procedures.
3. Assess the use and composition of physiological salt solutions and the assessment of antagonistic drug effects.
4. Familiarize with key laboratory instruments like organ baths, kymographs, analgesiometers, and behavioural tools.
5. Describe the principles and types of toxicity studies, including acute, subacute, and chronic toxicity

Unit 1 Bioassay حیاتی تعین

24.1.1. Introduction and Principles of Bioassay

24.1.2. Application and Classification of bioassay

24.1.3. Methodology of Bioassay

24.1.4. Biological variation and methodological errors in Bioassay

24.1.5. Drug Response Relationship

24.1.6. Physiological salt solution, Dose Cycle and Response

24.1.7. Bioassay of Antagonists

References: 207,214,215,223,224,226,227

3A	3B	3C	3D	3E	3F	3G

CO8	Describe the fundamental and classifications of bioassays, and articulate their wide-ranging applications in pharmacological evaluation of drug potency and efficacy.	1	Lecture	CC	Knows-how	L,L&PPT
CO8	Describe the fundamental methodology of bioassay, identify common sources of biological variation, and recognize methodological errors that can impact the accuracy and reliability of bioassay results in pharmacological research.	1	Lecture	CC	Knows-how	L&PPT ,L
CO8	Discuss the fundamental principles of bioassay, including the construction and interpretation of dose-response relationships, the critical role of physiological salt solutions and dose cycles, and the specific methodologies employed in the bioassay of antagonists, relating these concepts to the pharmacological evaluation of Unani drugs.	1	Lecture	CAN	Knows-how	L&PPT ,L&GD,L
CO8	Conduct quantitative bioassays for agonists and antagonists, identify and analyze biological variation and common methodological errors, and interpret dose-response curves to evaluate drug potency and antagonist mechanisms.	6	Practical24.1	PSY-ADT	Shows-how	TPW,SIM,DL,PER
CO5,CO8	Apply the fundamental principles of bioassay to design, execute, and critically analyse a quantitative bioassay, interpret dose-response relationships, and understand the applications and classifications of bioassays in evaluating the potency and effects of substances, particularly in the context of Unani drug research.	9	Experiential-Learning24.1	PSY-MEC	Does	CBL,FV,SIM,D

Unit 2 Commonly used Instruments in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے عمومی آلات

24.2.1. Organ bath, Kymograph, Analgesiometers (Hot plate, tail flick), Plethysmometer, Actophotometer, Pole Climbing apparatus, Mazes

References: 207,214,215,226,227						
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**
CO1,CO3, CO4,CO8	Identify and describe the fundamental components and operational principles of key pharmacological apparatus including the Organ Bath, Kymograph, Analgesiometers (Hot Plate and Tail Flick), Plethysmometer, Actophotometer, Pole Climbing apparatus, and Mazes.	1	Lecture	CC	Knows-how	L&PPT ,L
CO1,CO3, CO4,CO8	Correlate and discuss the specific design features and functional utility of each apparatus (e.g., Organ Bath, Hot Plate, Plethysmometer) with their respective applications in evaluating specific pharmacological actions of drugs, such as effects on isolated tissues, pain, inflammation, or motor activity.	1	Lecture	CC	Knows-how	FC,JC,L&PPT
CO1,CO3, CO4,CO8	Describe the basic experimental setup and procedures associated with the instruments in preclinical drug evaluation.	1	Lecture	CC	Knows-how	L_VC,L,L&PPT
CO1,CO3, CO4,CO8	Identify limitations, sources of error, and safety/ethical considerations involved in using the instruments in animal experimentation.	1	Lecture	CC	Knows-how	L&GD,JC,L&PPT
CO1,CO3, CO4	Operate Hot Plate, Tail-Flick, and Plethysmometer apparatus, accurately measure nociceptive thresholds and paw edema, and analyze the resulting data to assess analgesic and anti-inflammatory drug effects relevant to Unani pharmacology.	7	Practical24.2	PSY-GUD	Shows-how	D,D-M,SIM
CO1,CO4, CO5,CO8	Operate the Actophotometer, Pole Climbing apparatus, and Mazes to assess locomotor activity, conditioned learning, and spatial memory, respectively, analyzing data for drug effects relevant to Unani psychopharmacology.	9	Experiential-Learning24.2	PSY-ADT	Knows-how	PER,DL,FV

Unit 3 Toxicity studies مطالعہ سمیت

24.3.1. Objective and Principles of Toxicity studies.

24.3.2. Acute, Subacute and Chronic Toxicity studies.

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Discuss the primary objectives of toxicity and the fundamental principles guiding their design and execution in drug development and safety assessment.	1	Lecture	CC	Knows-how	L_VC,L&PPT ,L
CO1,CO3, CO4,CO8	Classify and justify the application of toxicity studies based on their respective durations, experimental designs, and the specific regulatory or safety questions they aim to address for a given chemical or compound.	1	Lecture	CC	Knows-how	FC,L&GD,JC
CO1,CO3, CO4,CO8	Appraise the ethical and regulatory importance of meticulously designed and conducted toxicity studies in ensuring public health and environmental safety, recognizing the critical role these studies play in drug development, and risk assessment.	1	Lecture	AFT-SET	Knows-how	L&PPT ,BL,JC
CO1,CO3, CO4,CO8	Analyze provided acute and subacute toxicity study protocols and data, identify key indicators of organ toxicity, and interpret basic safety profiles of drugs.	7	Practical24.3	CAN	Shows-how	FC,PER,D,SIM
CO1,CO3, CO4,CO8	Evaluate acute, subacute, and chronic toxicity study designs with ethical consideration, synthesize findings from diverse parameters to characterize drug safety profiles, and propose preclinical safety assessment strategies for Unani formulations.	8	Experiential-Learning24.3	CE	Does	PBL,SDL,FC

Practical Training Activity
Practical Training 24.1 Bioassay – Variability, Errors & Antagonism
(Total duration of Activity: 6 hours) 1. The teacher will introduce the bioassay basics and ensure ethical approvals (CPCSEA). Teacher will prepare organ baths, fresh tissues, standard agonists (like Acetylcholine), and antagonists (like Atropine), along with "unknowns. Then, demonstrate tissue mounting, baseline establishment, and generating a standard agonist curve, highlighting common methodological errors like improper washing or dose cycling. The teacher will emphasise precise technique, accurate data recording, and troubleshooting. (2 hours) Or Vitual Lab simulation or pre-recorded videos of a comprehensive bioassay practical can be used for Bioassay. Here teacher will introduce concepts using the virtual lab software or videos and guide students through the simulated experiments (setting up, adding drugs, interpreting responses). Teacher will facilitate discussions on the "data" generated by the simulation, including simulated biological variation and potential errors. Assign pre-recorded videos of actual wet lab procedures to complement the simulation. Previous Case Study & Problem-Based Learning with Mock Data may also be presented by the teachers. (2 hours)2. Students will meticulously set up organ bath systems and mount isolated tissues. They'll then generate a standard agonist dose-response curve, carefully following the dose cycle and observing the impact of the physiological salt solution. Next, students will perform a bioassay of an "unknown" agonist and then conduct an antagonist bioassay, noting curve shifts. The session culminates in analyzing collected data, interpreting drug-response relationships and antagonist effects, and discussing the relevance to Unani pharmacology. (4 hours) Or Students will critically observe the video demonstrations, taking detailed notes on procedures, equipment, and troubleshooting. They will actively engage in discussions, asking questions about techniques shown in the videos. Using provided raw data sets, students will manually or using software (like Excel) plot dose-response curves, calculate potencies, and analyze antagonist effects. They will identify and discuss the sources of biological variation and methodological errors present in the given data, proposing solutions or explanations. Students will present their analysis and interpretations, correlating findings with Unani pharmacological principles. (4 hours)

Practical Training 24.2 Pain & Inflammation Assessment: Hot Plate /Tail-Flick/ Plethysmometer
Total duration of Activity: 7 hours) The teacher will ensure ethical approval (CPCSEA) for animal use and briefly describe safety and ethical issues, followed by step-wise (prepare instruments, pre-weighed animals (mice/rats), and standard drug solutions (analgesics, anti-inflammatories, saline control)) demonstrations of each apparatus (Hot Plate or Tail-Flick or Plethysmometer), emphasising proper animal handling, setting parameters, and data recording. (2 hours) Or Virtual Lab Simulations with Data Analysis Or Video Demonstrations & Case Study Analysis Students will observe detailed demonstrations of Hot Plate, Tail-Flick, and Plethysmometer operation. In groups, they will competently handle pre-weighed animals, administer drug solutions, and perform measurements for nociceptive thresholds (tail-flick latency, hot plate latency) and/or paw volume. They will meticulously record all data, paying attention to individual variations. Finally, students will analyze their collected data, interpret analgesic and anti-inflammatory effects, discuss experimental challenges, and correlate findings with Unani drug actions. (5 hours) Or Students will record responses and analyse the data to understand drug-response relationships, biological variation, and methodological errors, ultimately interpreting simulated drug effects within Unani pharmacology. Or Students will watch video demonstrations, taking detailed notes on procedures and animal handling; they'll then discuss observed techniques and analyze provided raw data
Practical Training 24.3 Toxicity Studies Fundamentals
(Total duration of Activity: 7 hours)

The teacher will provide detailed mock protocols and raw data sets or access to virtual toxicology simulations or high-quality videos demonstrating acute and subacute toxicity studies. Guide students through understanding the objectives, experimental design, and common observations or virtual protocol design (dosing, observations) and data collection. Facilitate data analysis, including calculation of LD50 or analysis of simulated/video-derived results (e.g., LD50 calculation, organ histopathology reports). The teacher will also emphasize on ethical considerations, common errors, and data interpretation relevant to preclinical safety evaluation of Unani drugs. (2 hours)

Students will analyze provided mock acute and subacute toxicity protocols and raw data or engage with virtual labs/videos to simulate/observe acute/subacute toxicity protocols and data collection.. They will interpret experimental designs, focusing on dosing, observations, and collection parameters or analyze provided mock protocols and raw data sets. Students will calculate LD50 values from simulated data, identify signs of organ toxicity from provided reports, and interpret drug safety profiles based on various parameters (e.g., mortality, behavioural changes, organ weights). They will discuss their findings, ethical aspects, and potential errors, integrating virtual observations with mock data analysis to understand preclinical safety for Unani formulations. (5 hours)

Experiential Learning Activity

Experiential-Learning Learning 24.1: Fundamentals and Practice of Bioassay.

(Total duration of Activity: 9 hours)

1. The students shall have a deep, hands-on understanding of bioassay principles. Begin with a concise lecture covering bioassay fundamentals, dose-response, physiological solutions, and dose cycles.

Then, demonstrate setting up the organ bath and calibrating the force transducer, emphasizing precision and ethical tissue handling. Teacher will ensure all necessary ethical approvals are in place for any animal tissue use. He/ She will procure freshly sacrificed animals (e.g., rats for colon, chickens for ileum) or ethically sourced organs just prior to the session. Alternatively, use preserved/simulated tissues if live are not feasible/ ethical. (3 hours)

Or

Presents a case study on failure/success of drug bioassay and asks students to analyse the causes (e.g., error, variability). (3 hours)

Or

Facilitates a virtual lab visit or video showing real bioassay procedures. Leads group discussion on handling variability and ethical issues. (3 hours)2. Student will hands-on set up organ bath systems, mount tissues, and precisely prepare drug dilutions. The core activity involves constructing standard dose-response curves and then bioassaying an "unknown" sample, meticulously recording all responses. Finally, students will analyze their collected data graphically, calculate potency, and critically discuss bioassay classifications, applications, and limitations in the context of Unani pharmacology, reinforcing ethical practices throughout. (6 hours) Or Students will do a literature survey of previous case studies and present the collected data discuss bioassay classifications, applications, and limitations in the context of Unani pharmacology (6 hours)
Experiential-Learning Learning 24.2: Behavioural Pharmacology Apparatus: Actophotometer, /Pole Climbing apparatus/ Mazes
(Total duration of Activity: 9 hours) The students shall have access to virtual lab simulations or high-quality video demonstrations of Actophotometer, Pole Climbing, and Mazes experiments. Emphasize ethical considerations and data accuracy. Guide students through virtual setups/video observations, data collection, and initial interpretation. Facilitate discussions on behavioral parameters, biological variation, methodological errors, and how data reflects drug effects. Assign specific virtual experiments or video analysis tasks, promoting critical thinking on Unani drug applications. Teacher may also present such previous studies on Unani single drugs and formulations. Or Live demonstration of these instruments (under ethical guidance may also be done if available) (3hours) Students will engage with virtual labs or video demonstrations of Actophotometer, Pole Climbing, and Mazes. They will collect and analyze simulated/observed behavioral data (e.g., locomotor counts, latencies, errors). Students will interpret these behavioral responses to assess drug effects on motor activity, anxiety, and cognitive functions. They will discuss sources of biological variation and potential methodological errors, applying their understanding to analyze the neuropsychopharmacological actions of Unani drugs. Student will also present findings of previous studies on Unani single drugs and formulations. (6 hours)
Experiential-Learning Learning 24.3: Comprehensive Toxicity Assessment and ethical consideration.

(Total duration of Activity: 8 hours)

1. Students shall collect comprehensive case studies encompassing acute, subacute, and chronic toxicity data. Challenge students to critique study designs, identify potential flaws, and synthesize complex integrated data (clinical, hematology, biochemistry, histopathology). Guide discussions on regulatory aspects, extrapolation to humans, and the specific challenges of assessing Unani drug safety, fostering independent critical evaluation and strategic thinking. (2 hours)2. Students will critically analyze provided comprehensive case studies of acute, subacute, and chronic toxicity studies. They will evaluate experimental designs, pinpointing methodological issues. Students will synthesize integrated data from all parameters to characterize the full toxicity profile of hypothetical drugs. They will then propose robust preclinical safety assessment strategies specifically for Unani formulations, justifying their approaches based on scientific principles and data analysis. Student will also present the ethical guidelines for toxicity studies. Student will also draw a summary chart comparing acute, subacute, and chronic study protocols. Present a short group discussion on minimizing animal use while ensuring safety data quality (6 hours)

Modular Assessment

Assessment	Hour
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. 1. Practical work using dummy models and simulation methods (15 Marks) 2. Presentation done during Experiential learning (15 Marks) 3. LAQ: 2 Questions (1 from Unit 1 and 1 from Uniit 2) (20 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Semester No : 6

Module 25 : In-Vivo Animal Experimentation studies حیوانات پر کیے جانے والے تجرباتی مطالعات/جاندار نسیج

Module Learning Objectives

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

1. Discuss and conduct anti-inflammatory, analgesic, and antipyretic studies using animal models like carrageenan edema, hot plate, and yeast-induced pyrexia.
2. Perform neuropharmacological tests, including Irwin's profile, antidepressant, anti-anxiety, and anticonvulsant assays.
3. Examine nephrotoxicity and hepatoprotective studies through biochemical, histological, and functional analysis of drug-induced damage.
4. Evaluate antidiabetic and hypolipidemic effects, assessing drug impact on glucose and lipid levels using chemical and genetic models

Unit 1 Antiinflammatory, Analgesic and Antipyretic Animal Experimentation studies دافع التہاب، دافع درد و دافع حمیٰ کے تجرباتی مطالعے

25.1.1. Antiinflammatory studies: Carrageenan-induced paw edema test, Formalin test, Cotton Pellet Granuloma test, Adjuvant-induced arthritis test

25.1.2. Analgesic studies: Hot plate test, Tail flick test, Writhing test, Sciatic nerve ligation model

25.1.3. Antipyretic studies: Yeast-induced pyrexia model, Cytokine-induced pyrexia

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the principles, methodologies, and ethical considerations involved in animal experimentation for evaluating anti-inflammatory, analgesic, and antipyretic activities and commonly used models for analgesic, antipyretic, and anti-inflammatory activities.	3	Lecture	CC	Know	L&PPT ,JC,L
CO1,CO3, CO4,CO8	Demonstrate analgesic, antipyretic and anti-inflammatory activities using simulation methods	5	Practical25.1	PSY-GUD	Knows-how	SIM,DL,D,D-M

CO1,CO3, CO4,CO8	Perform the test for screening of analgesic, antipyretic and anti-inflammatory activities using simulation methods	7	Experiential-Learning25.1	PSY-ADT	Shows-how	D-M,SIM

Unit 2 Neurological Studies **مطالعہ نظام عصبی**

25.2.1. Irwin's Profile

25.2.2. Antidepressant tests: Forced Swim Test, Tail Suspension Test, Sucrose Preference Test

25.2.3. Anti-anxiety tests: Elevated Plus Maze test, Open Field Test, Light-Dark Box test

25.2.4. Anticonvulsant tests: Maximal Electroshock Seizure Test, Pentylenetetrazole Induced Seizure Test, Kindling Models, Chemically induced seizures

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe commonly used animal models to evaluate CNS drugs, including Irwin's Profile, tests for antidepressant (FST, TST, SPT), anti-anxiety (EPM, OFT, LDB), and anticonvulsant (MES, PTZ, kindling) activities, and understand their relevance, procedures, and ethical considerations.	3	Lecture	CC	Know	JC,L&PPT ,L&GD,L_VC
CO1,CO3, CO4,CO8	Demonstrate and interpret key behavioral models for evaluating antidepressant, anti-anxiety, and anticonvulsant activities in animals, and apply ethical practices in preclinical CNS research	5	Practical25.2	PSY-GUD	Knows-how	L&PPT ,SIM,D,JC,DL
CO1,CO3, CO4,CO8	Apply behavioral models in live or simulated environments for evaluating antidepressant, anti-anxiety, and anticonvulsant drug effects, enhancing hands-on understanding and ethical practice in preclinical research	7	Experiential-Learning25.2	PSY-ADT	Shows-how	D-M,L_VC,L&PPT ,D,SIM

Unit 3 Nephrotoxicity and Hepatoprotective studies **گردوں کی سمیت اور تحفظ کبد سے متعلق مطالعے**

25.3.1. Nephrotoxicity studies: Drug-induced nephrotoxicity by cisplatin and gentamcin, Histological studies, Functional Assessments and Measurement of Oxidative stress markers

25.3.2. Hepatoprotective studies: Chemically Induced Hepatotoxicity by Carbon tetrachloride (CCl4), Paracetamol (acetaminophen), Thioacetamide (TAA) induced liver fibrosis, assessment of Biochemical Markers, Histopathological Examination

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe commonly used methods for hepatoprotective, and nephroprotective activities in animal models.	2	Lecture	CC	Know	L,L_VC,L&PPT ,JC
CO1,CO3, CO4,CO8	Demonstrate hepatoprotective, and nephroprotective studies using simulation methods.	5	Practical25.3	PSY-GUD	Knows-how	DL,D-M,D,SIM
CO1,CO3, CO4,CO8	Perform the test for screening of hepatoprotective, and nephroprotective studies using simulation software.	7	Experiential-Learning25.3	PSY-ADT	Shows-how	D-M,SIM,DL,D

Unit 4 Antidiabetic and Hypolipidemic Studies دافع ذیابیطس اور تقصیر تدسم سے متعلق مطالعے

25.4.1. Antidiabetic studies: Streptozotocin induced diabetes, Alloxan-induced diabetes, Assessment Parameters (Blood Glucose Levels, Insulin Levels, Lipid Profile, Histopathological examination of pancreatic beta-cells) Urine glucose and volume, Measurement of oxidative stress markers, Kidney function tests, Liver function tests.

25.4.2. Hypolipidemic Studies: High-Fat Diet-Induced Hyperlipidemia, Lipid Profile Analysis, Liver Function Tests, Histopathological Examination of tissues of the liver and arteries

References: 207,214,215,224,226,227

3A	3B	3C	3D	3E	3F	3G

CO1,CO3, CO4,CO8	Describe commonly used methods for anti-diabetic and hypolipidemic studies in animal models.	2	Lecture	CC	Know	L,L&GD,L&PPT ,L_VC,JC
CO1,CO3, CO4,CO8	Demonstrate anti-diabetic and hypolipidemic studies in animal models using simulation methods.	5	Practical25.4	PSY-GUD	Knows-how	SIM,D-M,DL,D
CO1,CO3, CO4,CO8	Perform the test for screening of anti-diabetic and hypolipidemic studies in animal models using simulation software	5	Experiential-Learning25.4	PSY-ADT	Shows-how	DL,L&PPT ,D-M,D,SIM

Practical Training Activity

Practical Training 25.1 *In-vivo* analgesic, antipyretic and anti-inflammatory activities using Animal Simulation Software

(Total duration of Activity: 5 hours)

1. The teacher will demonstrate how to assess analgesic, antipyretic, and anti-inflammatory activities using simulation methods. The teacher will explain the principles behind each activity, showcasing how simulations can mimic the effects of various drugs on pain relief, fever reduction, and inflammation.(3hours)
2. Following the demonstration, students will use the simulation methods to replicate these studies, observing and analyzing the effects of different drugs on each activity. They will then interpret the simulated results and understand the relevance of these methods in pharmacological research.(2hours)

Practical Training 25.2 Perform CNS behavioral tests such as Forced Swim Test (FST), Elevated Plus Maze (EPM), and Maximal Electroshock Seizure (MES) test. The session includes data recording, result interpretation, and understanding ethical handling of animals.

(Total duration of Activity: 5 hours)Teacher Activities:

Teacher briefs students on the principles and relevance of each behavioral test. Demonstrates experimental procedures such as Forced Swim Test (FST), Elevated Plus Maze (EPM), and Maximal Electroshock Seizure (MES) test. Supervises the session to ensure correct technique and adherence to ethical guidelines. Guides students in recording observations, analyzing data, and discussing results. Conducts assessment through viva voce and evaluation of submitted lab reports.(2hours)

Student Activities:

Students observe or perform assigned behavioral tests under supervision. Record behavioral parameters such as immobility time in FST, time spent in open arms in EPM, or seizure onset in MES. Analyze the data to interpret the pharmacological effects of the test compounds. Prepare and submit a concise practical report. Participate in post-experiment discussions to clarify concepts and strengthen understanding.(3hours)

Practical Training 25.3 Hepatoprotective, and Nephroprotective studies using simulation methods.

(Total duration of Activity: 5 hours)

1. The teacher will demonstrate the use of Animal Simulation Software for hepatoprotective, and nephroprotective studies, explaining how the software simulates the effects of substances on liver protection, and kidney function. (3hours)
2. Students will then use the software to perform these studies, observing and analyzing the effects of various compounds on the gastrointestinal, hepatic, and renal systems, and understanding their pharmacological impact on liver, and kidney protection. (2hours)

Practical Training 25.4 Anti-diabetic and hypolipidemic studies using simulation methods

(Total duration of Activity: 5 hours)

1. The teacher will demonstrate anti-diabetic and hypolipidemic studies in animal models using simulation methods, explaining how the simulation software replicates the effects of different compounds on blood glucose levels and lipid profiles.(3hours)
2. Students will then use the simulation methods to conduct these studies, observing the effects of various compounds on glucose and lipid levels.(2hours)

Experiential Learning Activity

Experiential-Learning Learning 25.1:

- Screening of analgesic, antipyretic and anti-inflammatory activities using simulation methods

Preparation of experimental design on analgesic, antipyretic and anti-inflammatory activities using animal models

(Total duration of Activity: 7 hours)

1. Students will use animal simulation software and audio-visual methods to learn the screening process for analgesic activity in animal models and document their findings.(2hours) 2.Students will explore the simulation and audio-visual resources to learn about the screening of antipyretic activity & anti-inflammatory activity. (2hours) 3.Students will prepare a project on the experimental design for analgesic, antipyretic, and anti-inflammatory studies in animal models. They will structure the project based on their experiential learning and submit it for review.(3hours)
Experiential-Learning Learning 25.2: Students engage in observation, simulation, or participation in tests like Irwin's Profile, FST, EPM, and MES to experience real-time animal behavior analysis, drug response evaluation, and data interpretation in a controlled, ethical setting
(Total duration of Activity: 7hours) Teacher Activities: Facilitates live demonstrations or simulation-based experiments. Assigns real or simulated case scenarios for students to analyze. Guides students in observing and interpreting behavioral changes related to CNS drug effects. Encourages reflective learning through questions and discussions. Assesses student understanding through presentations, reports, or discussions.(3hours) Student Activities: Participate in live or simulated CNS behavioral experiments. Observe and document behavioral responses (e.g., immobility, seizure activity, anxiety indicators). Analyze the data to understand the drug's pharmacological effects. Reflect on the outcomes, ethical considerations, and relevance to human CNS disorders. Present their findings through individual or group reports and discussions(4hours)
Experiential-Learning Learning 25.3: Screening of hepatoprotective, and nephroprotective studies using simulation methods Preparation of experimental design on hepatoprotective, and nephroprotective studies using animal models.
(Total duration of Activity: 7 hours) 1.Students will use animal simulation software and audio-visual resources to learn the screening process for hepatoprotective activity and nephroprotective activity. (4hours)

2. Students will prepare a project on the experimental design for hepatoprotective, and nephroprotective studies in animal models, reflecting their experiential learning, and submit it according to the teacher's instructions (3 hours).	
Experiential-Learning Learning 25.4: Screening of anti-diabetic and hypolipidemic studies using simulation methods. Preparation of experimental design on anti-diabetic and hypolipidemic studies using animal models.	
(Total duration of Activity: 7 hours) 1. Students will use animal simulation software and audio-visual resources to learn the screening process for anti-diabetic activity and hypolipidemic activity. (4hours) 2. Students will prepare a project on the experimental design for conducting anti-diabetic and hypolipidemic studies in animal models.(3hours).	
Modular Assessment	
Assessment	**Hour**
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. 1. Practical work using simulation methods (20 Marks) 2. Presentation done during Experiential learning (10 Marks) 3. SAQ: 4 Questions (1 from each unit) (20 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4
Module 26 : Secondary metabolites of medicinal plants طبی نباتات کے ثانوی استحالاتی مرکبات	

Module Learning Objectives

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

1. Discuss the properties, extraction methods, classification, and therapeutic uses of alkaloids and glycosides.
2. Describe the chemical characteristics, sources, and medicinal applications of lipids and volatile oils.
3. Examine the properties and traditional medicinal uses of gums and resins.
4. Assess the chemical structures, classifications, and therapeutic potentials of tannins and saponins.

Unit 1 Alkaloids and Glycosides الکلائڈس اور گلائیکوسائیڈز

26.1.1. Alkaloids: Introduction, Physical and Chemical Properties, Isolation and Extraction of Alkaloids, Classification of Alkaloids, Therapeutic uses, Role of Alkaloids in Plants occurrence and Distribution of Alkaloids

26.1.2. Alkaloid Containing Drugs - Classification and source Indole Alkaloids (*Strychnos nux-vomica, Rauvolfia serpentina, Catharanthus roseus, Claviceps purpurea*) Isoquinoline Alkaloids (*Berberis aristata, Papaver somniferum*) Tropane Alkaloids (*Datura stramonium, Atropa Belladona Hyoscyamus niger*) Quinoline Alkaloids (Cinchona- *Cinchona officinalis*) Amino Alkaloids (Colchicum autumnale, Ephedra- *Ephedra sinica*) Pyridine Alkaloids (*Areca catechu, Lobelia inflata*) Purine Alkaloids (*Coffea arabica, Camellia sinensis*) Imidazole Alkaloids (Pilocarpus- *Pilocarpus microphyllus*) Steroidal Alkaloids (*Withania somnifera, Holarrhena antidysenterica*) Diterpene Alkaloids (*Aconitum napellus*) Quinazoline Alkaloids (*Justicia adhatoda/ Adhatoda vasica* Nees) Miscellaneous alkaloids (*Eclipta alba, Phyllanthus niruri, Convolvulus pluricaulis*)

26.1.3. Glycosides: Physical and Chemical Properties, Isolation and Extraction of Glycosides, Classification of Glycosides, Role of Glycosides in Plants, Therapeutic uses Occurrence and Distribution of Glycosides containing drugs:

26.1.4. Glycoside Containing Drugs - Classification and source Anthracene Glycosides (*Aloe vera, Rheum rhabarbarum, Senna alexandrina/ Cassia angustifolia/ Cassia acutifolia*) Steroidal Glycosides (*Digitalis purpurea*, Scilla maritima/ *Urginea maritima*) Saponin Glycosides (*Bacopa monnieri, Tribulus terrestris, Asparagus racemosus, Glycyrrhiza glabra, Centella asiatica*) Cyanogenetic Glycosides (Prunus - *Prunus dulcis, Prunus avium*) Isothiocyanate Glycosides (Mustard seeds - *Brassica juncea*, *Brassica nigra*) Flavonoidal Glycosides (*Citrus limon*, *Citrus medica*) Coumarin and Furanocoumarine glycosides (*Ammi majos*, *Psoralea corylifolia*) Aldehyde Glycosides (*Hemidesmus indicus*, *Vanilla planifolia*) Phenol Glycosides (Arctostaphylos uva-ursi) Steroidal Glyco-Alkaloides

(Solanum- *Solanum nigrum, Solanum aculeastrum, Solanum tuberosum*) Bitter Glycosides (Gentiana - *Swertia chirata, Gentiana lutea*) Miscellaneous Glycosides (*Gymnema sylvestre*, *Tinospora cordifolia, Lawsonia inermis, Andrographis paniculata, Picrorhiza kurroa, Stevia rebaudiana*)

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the introduction, physical-chemical properties, isolation, extraction, and detailed classification of major alkaloid and glycoside types, identify their therapeutic uses and occurrence in specific medicinal plants.	3	Lecture	CC	Know	L,L&PPT ,JC,L_VC
CO1,CO3, CO4,CO8	Perform simple chemical tests on powdered crude drugs to identify the presence of alkaloids and glycosides and interpret the results based on visual indicators.	5	Practical26.1	PSY-GUD	Knows-how	DIS,DA,D,L&PPT ,DL
CO1,CO3, CO4,CO8	Assess the classification, properties, distribution, and therapeutic roles of alkaloids and glycosides, and identify key medicinal plants that contain them.	7	Experiential-Learning26.1	PSY-ADT	Does	DA,L&PPT ,DL

Unit 2 Lipids and Volatile oils شحمیات اور روغن فراری

26.2.1. Lipids (Fixed Oils, Fats and Waxes): Introduction, Chemical tests for identification of Fixed Oils or Fats, Classification of Fixed Oils, Therapeutic effects, Analytical Parameters for Oils and Fats Waxes and Uses

26.2.2. Fixed oils containing drugs and Classification Classification Based on Source: *Plant-Based Fixed Oils* Seed Oils (Sunflower oil, Sesame oil, Castor oil, Cottonseed oil) Fruit Oils (Olive oil, Coconut oil, Avocado oil) Nut Oils (Almond oil, Walnut oil) *Animal-Based Fixed Oils* Liver Oils (Cod liver oil) Other Animal Oils (Lard) Based on Fatty Acid Composition Saturated Oils (Coconut oil, Palm oil, Animal fats) Unsaturated Oils (Monounsaturated Oils: Olive oil, Peanut oil) Polyunsaturated Oils (Sunflower oil, Corn oil, Soybean oil) Classification Based on Consistency Liquid Oils (Sunflower oil, Cottonseed oil) Semi-Solid Oils (Coconut oil, Palm oil) Solid Oils (Derived from animal fats - Tallow, Lard) Classification Based on Use Edible Oils (Olive oil, Sunflower oil, Soybean oil) Medicinal Oils (Castor oil, Neem oil, Linseed oil, Blackseed oil) Industrial Oils (Castor oil, Tung oil) Cosmetic Oils (Almond oil) Classification Based on Extraction Method *Cold-Pressed Oils* (Extra virgin olive oil, Sunflower oil) *Hot-Pressed Oils* (Groundnut oil) *Solvent Extracted Oils* (Soybean oil, Corn oil)

26.2.3. Volatile oils and Terpenoids Volatile Oils: Introduction, Chemical tests for Volatile Oils, Analytical Parameters for Volatile Oils and Therapeutic actions. Terpenoids: Introduction, General Properties, Isolation of Terpenoids, Therapeutic actions.

26.2.4. Volatile oils containing drugs and Classification: Classification of Based on Source Flower Oils (Rose oil, Jasmine oil, Lavender oil) Leaf Oils (Eucalyptus oil, Peppermint oil, Spearmint oil) Fruit Oils (Orange oil, Lemon oil) Seed Oils (Coriander oil, Caraway oil) Root Oils (Ginger oil, Asafoetida oil) Wood Oils (Sandalwood oil, Cedarwood oil, Agarwood Oil, Camphor Oil) Bark Oils (Cinnamon oil) Resin Oils (Myrrh oil) Classification Based on Chemical Composition Terpene-Based Oils: Monoterpene Oils (Lemon oil, Orange oil), Sesquiterpene Oils (Sandalwood oil, Cedarwood oil), Diterpene Oils (Rosemary oil) Phenolic-Based Oils (Clove oil, Thyme oil) Aldehyde-Based Oils (Cinnamon oil, Citral oil- Lemongrass oil and Lemon oil) Ketone-Based Oils (Peppermint oil, Eucalyptus oil) Esters (Lavender oil, Sweet orange oil) Classification Based on Method of Extraction Steam Distilled Oils (Peppermint oil, Eucalyptus oil, Lavender oil) Cold Pressed Oils (Lemon oil, Orange oil) Solvent Extracted Oils (Jasmine oil, Rose oil) Enfleurage (Jasmine absolute oil) CO2 Extraction (Rose oil, Lavender oil)

26.2.5. Terpenoid containing drugs and classification Monoterpenoid containing Drugs (*Cinnamomum camphora*, *Carum carvi*, *Eucalyptus globulus*, *Foeniculum vulgare*, *Mentha piperita*, *Lavandula angustifolia*, *Citrus limon*, *Cymbopogon citratus*, *Ocimum tenuiflorum*, and *Myristica fragrans*) Drugs containing Sesquiterpenoids (*Acorus calamus*, *Artemisia absinthium*, *Syzygium aromaticum*, *Piper cubeba*, *Santalum album*, *Saussurea lappa*, and *Valeriana officinalis*) Drugs containing Diterpenoids (*Taxus baccata*) Drugs containing Triterpenoids (Ambergiris - *Physeter macrocephalus*) Drugs containing Tetraterpenoids and Polyterpenoids (*Crocus sativus*)

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the Classification, identification, and difference between various types of lipids (fixed oils, fats, and waxes) and volatile oils (including terpenoids), explaining their chemical properties, analytical parameters, and therapeutic applications in Unani medicine.	3	Lecture	CC	Know	L&PPT ,JC,L,L&GD
CO1,CO3, CO4,CO8	Perform chemical identification tests for fixed and volatile oils, including the assessment of key analytical parameters such as acid value, iodine value, and	5	Practical26.2	PSY-GUD	Knows-how	DL,D,DA,L&PPT

	saponification value. Interpret the test results to evaluate the quality and authenticity of oil samples.					
CO1,CO3, CO4,CO8	Classify and analyse fixed and volatile oils based on their source, chemical composition, uses, and methods of extraction; to recognize the therapeutic roles of major fixed oils, volatile oils, and terpenoid-containing drugs.	7	Experiential-Learning26.2	PSY-ADT	Does	D,DA,L&PPT ,DL

Unit 3 Gums and Resins صمغیات وراتینج

26.3.1. Gums: Introduction, Characteristics, Properties, therapeutic actions, and classification of Gums

26.3.2. Gums containing drugs: *Acacia senegal/ Acacia arabica*, *Astragalus gummifer, Boswellia serrata, Ferula assa-foetida*, *Pistacia lentiscus*

26.3.3. Resins Introduction, Properties, Tests for identification, Isolation of Resins, Therapeutic actions

26.3.4. Resins containing drugs and classification: Classification based on their type of constituents (Acid resins, Ester Resins, Resin alcohols) Classification based on their combination (Oleoresin, Oleo-gum resins, Glycoresins, Balsams, Ressenes) Drugs containing Resins (*Ferula assa-foetida*, *Boswellia serrata*, *Cannabis sativa*, *Capsicum annuum*, *Citrullus colocynthis*, *Curcuma longa*, *Ipomoea purga*, *Zingiber officinale*, *Commiphora wightii*, *Ipomoea purga*, *Commiphora myrrha*, *Myroxylon balsamum*, *Laccifer lacca*, and *Pinus roxburghii*)

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the introduction, characteristics, properties, therapeutic actions, and diverse classifications of Gums and Resins, identify and differentiate key Unani drugs containing these exudates and explain their relevance in Unani therapeutics based on their phytoconstituents.	2	Lecture	CC	Know	L_VC,L,L&PPT ,TBL,ML
CO1,CO3, CO4,CO8	Perform identification tests for gums and resins, understand methods for isolation and extraction, and analyze their physical and chemical properties. They will	5	Practical26.3	PSY-GUD	Knows-how	D,L&PPT ,L,DL

	develop practical skills in handling gum and resin samples and interpreting test results.					
CO1,CO3, CO4,CO8	Evaluate the characteristics, and properties of gums and resins. They will classify gums and resins based on their types and constituents, and recognize the therapeutic actions and significance of selected drugs containing gums and resins.	7	Experiential-Learning26.3	PSY-ADT	Does	L&PPT ,D,DG,FV

Unit 4 Tannins and Saponins ٹینسٹرزاورساپونز

26.4.1. Tannins: Introduction, Properties, Therapeutic actions, and Isolation

26.4.2.Tannins containing drugs and Classification: 1. Classification Based on Chemical Structure

26.4.2.1. Hydrolyzable Tannins: Glotannins: (Oak gall - frm the Quercus species), Ellagitannins: (Pomegranate tannin - *Punica granatum*, Raspberry tannin - *Rubus idaeus*)

26.4.2.1.1. Condensed Tannins: Proanthocyanidins (*Theobroma cacao*, *Vitis vinifera*, and *Pinus pinaster*) 2. Classification Based on Solubility

26.4.2.2.1. Water-Soluble Tannins (Gallotannins, Ellagitannins, Oak gall tannins, Tea tannins)

26.4.2.2.2. Alcohol-Soluble Tannins (Pine bark tannins, Cocoa tannins) 3. Classification Based on Behavior

26.4.2.3.1.True Tannins (Gallotannins: *Quercus infectoria, Rhus coriaria*), (Ellagitannins: *Punica granatum*, *Rubus* spp - Blackberries, *Rubus idaeus*)

26.4.2.3.2. Pseudotannins (Catechins - *Camellia sinensis*, Flavonoids - *Ginkgo biloba* (Ginkgo) and various *Citrus* species, *Vitis vinifera*). 4. Classification Based on Occurrence

26.4.2.4.1. Vegetable Tannins (Plant Tannins): (Tea -*Camellia sinensis*, Galls - *Quercus species*, Sumac - *Rhus species*)

26.4.2.4.2. Animal Tannins (Honey - *Apis mellifera*, Galls - *Quercus infectoria*)

26.4.3. Saponins: Introduction, Properties, therapeutic actions, and Tests for Identification, Isolation Methods

26.4.4. Saponins containing drugs and Classification: 1. Classification Based on Chemical Structure

26.4.4.1. Triterpenoid Saponins (Ginsenosides from *Panax ginseng*, Aescin from *Aesculus hippocastanum*, Quillaja saponins from *Quillaja Saponaria*, Soyasaponins from *Glycine max*)

26.4.4.1.1. Steroidal Saponins Diosgenin from Dioscorea (wild yam). Solasonine and Solamargine from Solanum species (e.g., *Solanum dulcamara*). Sarsasapogenin from Sarsaparilla (Smilax species). 2. Classification Based on Glycosidic Linkage

26.4.4.2.1 Monosaccharidic Saponins: Quillaja saponins

26.4.4.2.2 Disaccharidic Saponins: Ginseng

26.4.4.2.3 Oligosaccharidic Saponins: Soya saponins, 3. Classification Based on Source

26.4.4.3.1. Leguminosae: (*Glycine max*, *Cicer arietinum*, Lupins)

26.4.4.3.2. Asteraceae: *Cichorium intybus*, Echinacea - *Echinacea purpurea*, *Echinacea angustifolia*.

26.4.4.3.3 Sapindaceae: *Quillaja saponaria*, *Sapindus mukorossi*

26.4.4.3.4 Dioscoreaceae: Wild yam - *Dioscorea villosa, Dioscorea floribunda*

26.4.4.4.1 Classification Based on Biological Activity 5. Classification Based on the Presence of Specific Functional Groups

26.4.4.5.1 Oleanane-Type Saponins: Aescin.

26.4.4.5.2. Ursane-Type Saponins: Asiaticoside.

26.4.4.5.3. Dammarane-Type Saponins: Ginsenosides

References: 201,203,204,221,225,229,230,231,232,233,234,235

3A	3B	3C	3D	3E	3F	3G
CO1,CO3, CO4,CO8	Describe the introduction, properties, therapeutic actions, and isolation methods of Tannins and Saponins, and classify major drugs containing these compounds based on their diverse chemical structures, solubility, behavior, botanical occurrence, and biological activity.	2	Lecture	CC	Know	L&PPT ,JC,L,L_VC
CO1,CO3, CO4,CO8	Perform identification tests for tannins and saponins, understand their physical and chemical properties, and learn basic isolation techniques. They will correlate test	5	Practical26.4	PSY-GUD	Knows-how	DL,L&PPT ,D

	results with the quality and therapeutic potential of crude drugs containing tannins and saponins.					
CO1,CO3, CO4,CO8	Assess the classification, properties, therapeutic actions, and sources of tannins and saponins. They will identify different types of tannins based on chemical structure, solubility, behavior, and occurrence, as well as classify saponins based on chemical structure, glycosidic linkage, source, and biological activity.	5	Experiential-Learning26.4	PSY-ADT	Does	FV,DL,DG
Practical Training Activity						
Practical Training 26.1 Identification of Alkaloid and Glycoside Containing Crude Drugs through Organoleptic and Chemical Tests.						
(Total duration of Activity: 5 hours) The teacher will demonstrate the use of confirmatory reagents such as Dragendorff's, Mayer's, and Wagner's for alkaloids, and Keller-Kiliani and Borntrager's tests for glycosides. The procedure for preparing test solutions and interpreting color changes or precipitate formation will be explained. The teacher will supervise students during hands-on testing to ensure accuracy and safety. **(2 hours)** Students will select powdered crude drugs (e.g., Strychnos *nux-vomica*, *rauvolfia serpentina*, *withania somnifera*) and perform an organoleptic examination observing characteristics such as color, odour, taste and texture. They will then conduct chemical tests on the same sample to confirm the presence of alkaloids or glycosides. **(3 hours)**						
Practical Training 26.2 Identification and Analysis of Fixed and Volatile Oils Using Chemical and Analytical Methods.						
(Total duration of Activity: 5 hours) The teacher will demonstrate standard chemical tests for lipids and volatile oils, including turbidity test, alcohol solubility, and acid value estimation. Each test will be explained step-by-step with its significance in evaluating oil quality. Teachers will also show how to record and interpret values using simple calculations. **(2 hour)**.Students will perform practical identification tests for given oil samples, observe and record results (e.g., solubility behavior, color change). They will analyze the sample further by calculating analytical parameters like acid or iodine value using sample data. **(3 hours)**						

Practical Training 26.3 Identification, Extraction, and Testing of Gums and Resins.
(Total duration of Activity: 5 hours) The teacher will demonstrate standard tests to identify gums and resins, including solubility and physical tests. Procedures for isolation and extraction of resins will be shown using laboratory apparatus. **(1 hour 30 min).** Students will perform chemical and physical tests on gum and resin samples, record observations, and interpret the results. They will conduct simple extraction or isolation procedures under supervision. **(3 hours 30 min).**
Practical Training 26.4 Chemical Identification and Isolation Techniques of Tannins and Saponins.
(Total duration of Activity: 5 hours) The teacher will demonstrate standard chemical tests for tannins (like ferric chloride test) and saponins (foam test), along with isolation procedures. Safety measures and proper handling of reagents and crude drugs will be emphasized. Students will be guided step-by-step to perform the tests and interpret results accurately. (2 hour) Students will conduct chemical identification tests on provided plant samples to detect tannins and saponins. They will perform isolation procedures under supervision and record observations in lab notebooks. Students will analyze test results to classify the samples and discuss the implications for therapeutic use and quality assessment. (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 26.1: Theoretical understanding of Alkaloids and Glycosides.
(Total duration of Activity: 7 hours) Teacher will guides the students the to understand the classification, as well as the physical and chemical properties of alkaloids and glycosides. The teacher will use plant images to effectively demonstrate their natural occurrence and distribution within various plant species. Therapeutic actions of key classes—such as indole, isoquinoline, tropane alkaloids, and anthracene glycosides—will be explained with clarity. (2 hours 30 minutes)

Students participate by identifying, collecting, and documenting medicinal plants or crude drug samples, preparing herbarium sheets if applicable, performing sensory evaluations, and compiling detailed notes and photographic records, thereby reinforcing their understanding of the natural sources, classification, and practical uses of these phytochemicals through direct observation and hands-on engagement. (4 hours 30 minutes)
Experiential-Learning Learning 26.2: Understanding the Classification, Sources, and Therapeutic Applications of Lipids and Volatile Oils.
(Total duration of Activity: 7 hours) The teacher will introduce and explain the fundamental concepts of lipids—including fixed oils, fats, and waxes—and volatile oils by using classification charts, plant-based and animal-based oil samples, and labeled diagrams. The session will cover their chemical composition, natural occurrence in plants, extraction methods (such as cold pressing, steam distillation, and solvent extraction), and therapeutic applications. **(3 hours)** Students will examine sample charts, diagrams, or actual specimens of crude drugs to learn how to classify fixed oils, volatile oils, and terpenoid-containing drugs based on their source, chemical composition, use, and method of extraction. They will engage in group discussions to link each oil or drug to its origin, extraction technique (e.g., steam distillation, cold pressing), and therapeutic application. **(4 hours)**
Experiential-Learning Learning 26.3: Understanding the Characteristics, Classification, and Therapeutic Uses of Gums and Resins.
(Total duration of Activity: 7 hours) The teacher will present an overview of gums and resins using samples, charts, and diagrams to explain their physical and chemical characteristics, classification, and therapeutic uses. Key drugs containing gums and resins will be introduced with their botanical sources and uses. **(3 hours)** Students will observe and handle real gum and resin samples or visual aids to identify their properties. They will participate in group discussions to classify gums and resins and list their therapeutic uses. **(4 hours)**
Experiential-Learning Learning 26.4: Classification, Properties, and Therapeutic Significance of Tannins and Saponins.
(Total duration of Activity: 7 hours) The teacher will explain the general introduction, chemical structure, classification, and therapeutic roles of tannins and saponins using diagrams, flowcharts, and samples. Key drugs containing tannins and saponins will be discussed.(3 hours)

Students will observe sample charts and specimens of tannin- and saponin-containing drugs. They will engage in group discussions to classify the samples based on their chemical structure and source. Students will create concept maps or charts summarizing classification schemes and therapeutic uses. (4 hour)	
Modular Assessment	
Assessment	**Hour**
Instructions: Conduct a structured modular assessment. Assessment will be for 50 marks. Keep a structured marking pattern. Use different assessment methods in each module for the semester. Keep a record of the structured pattern used for assessment. Calculate the Modular grade point as per Table 6C. 1. Practical work (15 Marks) 2. Field report evaluation (15 Marks) 3. LAQ: 1 Question (from any Unit) (10 Marks) 4. SAQ: 2 Questions (from any Unit) (10 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Paper No : 4(UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)

Semester No : 3

Module 27 : Unani Cosmetology یونانی تزئینیات

Module Learning Objectives

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

1 Describe about the different types of Unani cosmetics and cosmeceutical products along with Itriyat.

2 Conduct the processes involved in developing cosmetic products, from formulation to production.

3 Identify and understand the raw material, natural and artificial excipients used in Unani cosmetics, their properties, and benefits.

Unit 1 Introduction of Unani Cosmeceuticals یونانی تزئینیات کا تعارف

27.1.1: The historical background, and development تاریخی پس منظر اور پیش رفت

27.1.2: Introduction, classification, and scope of Unani cosmetology یونانی تزئینیات کا تعارف، درجہ بندی اور دائرہ کار

27.1.3: Ingredients used in the Unani cosmetology یونانی امور زینت میں استعمال ہونے والے اجزاء

References: 12,30,42,48,52,56,57,58,59,61,62,64,67,74,83,89,94,104,105,106,109,119,121,127,128,132,137,148,173

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Describe Unani cosmetology	2	Lecture	CC	Knows-how	L,L&PPT
CO1,CO2	Identify ingredients used in Unani cosmetology	3	Practical27.1	PSY-GUD	Shows-how	PT,DIS
CO1,CO2	Analyze chronological development, classification and use of Unani cosmetology ingredients	6	Experiential-Learning27.1	CE	Does	PER,SDL,DIS

Unit 2 Excipients used in Unani Cosmetics یونانی تزئینیات میں غیر فعال اجزاء کا استعمال

27.2.1: Natural and Artificial excipients قدرتی اور مصنوعی غیر فعال اجزاء

27.2.2: Classification and application درجہ بندی اور اطلاق

References: 12,42,48,67,89,119,140,148

3A	3B	3C	3D	3E	3F	3G
CO1,CO2, CO3	Describe Natural and Artificial excipients	2	Lecture	CC	Knows-how	L&PPT ,L
CO1,CO2, CO3	Demonstrate classification and application of excipients	3	Practical27.2	PSY-SET	Shows-how	PER,SDL,PT,D
CO2,CO3	Participate in cosmetic formulation using excipients	6	Experiential-Learning27.2	AFT-REC	Does	PER,PrBL,FV,DIS,DL

Unit 3 'Itriyāt (Perfumery and fragrances) عطریات

27.3.1: Introduction and history of 'Itriyāt(Perfumes) عطریات کا تعارف اور اس کا تاریخی پس منظر

27.3.2: Ingredients and Extraction methods of 'Itriyāt عطریات کے اجزاء اور کشید کرنے کے طریقہ

References: 6,15,30,42,48,60,65,94,120,125,132,133

3A	3B	3C	3D	3E	3F	3G
CO1	Describe Itriyat	2	Lecture	CC	Knows-how	L&PPT ,L
CO1,CO2	Display extraction method of Itriyat	6	Practical27.3	PSY-GUD	Shows-how	PER,D,PT

CO1,CO2, CO3	Apply techniques for the formulation of Itriyat	6	Experiential-Learning27.3	AFT-CHR	Does	FC,PrBL,W,PER

Unit 4 Product Development مصنوعات کے فروغ کے مراحل

27.4.1: Raw materials, equipments and machinery used in Unani cosmetics یونانی تزئینیات کی ترکیب میں استعمال ہونے والے خام اجزاء، آلات اور مشین

27.4.2: Process of developing cosmetic products مصنوعات آرائش کی ترکیب اور فروغ کے مراحل

References: 12,28,48,60,83,89,90,108,126,138,150,153,161,162,163

3A	3B	3C	3D	3E	3F	3G
CO1,CO2, CO3	Describe Raw materials, equipments and machinery used in Unani cosmetics	4	Lecture	CC	Knows-how	L&GD,L&PPT
CO2,CO3	Display process of cosmetic formulation and development	8	Practical27.4	PSY-GUD	Shows-how	DIS,PT,D,PER
CO2,CO3	Participate in cosmetic development process	8	Experiential-Learning27.4	AFT-RES	Does	PER,PrBL,FC

Practical Training Activity

Practical Training 27.1 **Ingredients used in Unani Cosmetology**

(Total duration of Activity 03 hours)

Teachers should provide students with samples of herbs used in Unani cosmetics. (1 hour)

Each student should identify and record their uses. (1 hour)

Students will identify different herbal ingredients used in Unani cosmetics. (1 hour)

Practical Training 27.2 **Classification and application of excipients**
(Total duration of Activity 03 hours) Teachers should describe each class of excipients with examples. (01 hour) Students will classify excipients based on their functions and uses in Unani formulations. (01 hour) Students will observe how each excipient influences the final product. (01 hour)
Practical Training 27.3 **Extraction method of Itriyat (Perfumery and fragrances)**
(Total duration of Activity 06 hours) 1. Teachers should demonstrate the setup of a steam distillation unit and guide students through the extraction process. Safety precautions must be explained. (01 hour) 2. Students will extract essential oils from Unani ingredients using steam distillation. (05 hour)
Practical Training 27.4 **Process of cosmetic formulation and development**
(Total duration of Activity 08 hours) 1. Teachers should guide students through the formulation process, including the concept of the ingredients used in the formulation. (01 hour) 2. Students will formulate a cosmetic product like a moisturizer or face cream using Unani ingredients. (Collection and Processing of Drug and excipients - 04 hours, Product formulation - 03 hour)
Experiential Learning Activity
Experiential-Learning Learning 27.1: **Herbal Ingredient Sourcing / Procurement**

(Total duration of Activity 06 hours)

1. Student shall learn quality herbs selection and sourcing ethically. (01 hour)

2. Students will visit local markets or farms to source Unani cosmetic ingredients. (04 hour)

3. Students will document their findings. (01 hour)

Experiential-Learning Learning 27.2: **Field Visit to a Cosmetic Industry/Preparation of a cosmetic in an In-house lab.**

(Total duration of Activity 06 hours)

1. Student shall visit the preparation unit of Unani cosmetics or cosult experts to observe excipient usage in real-time. (01 hour)

2. A follow-up discussion should be conducted. (01 hour)

3. Students will visit a cosmetic manufacturing unit or in-house laboratory to observe the usage of excipients in production. (04 hour)

Experiential-Learning Learning 27.3: **Itriyat (Scent) Identification Workshop**

(Total duration of Activity 06 hours)

1. Students will inspect various samples of natural scents and document the information about their identification. (01 hour)

2. Students will classify the Khushboojat (scents) and record their effects based on Unani principles. (01 hour)

3. Students will participate in a workshop to identify various Khushboojat (scents) and their therapeutic uses in Unani medicine. (04 hours)

Experiential-Learning Learning 27.4: Development of a new cosmetic product

(Total duration of Activity 08 hours)

1. Students will go through the literature and prepares prepare a concept note and feasibility report about cosmetic products. (01 hour)

2. Students will develop a new cosmetic product concept and research its feasibility, including ingredient sourcing and marketing. (07 hours)

Modular Assessment	
Assessment	**Hour**
Instructions- 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 6 C. Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks) Or Assessment and evaluation of published paper on a particular topic (50 Marks) Field visit report and its learning outcomes (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4
Module 28 : Production of Unani cosmetics یونانی صنعت تزئینیات	
Module Learning Objectives (At the end of the module, the students should be able to) 1. Describe formulation methods of different categories of Unani cosmetic and cosmeceutical products. 2. Conduct research and development to innovate new products and improve existing Unani cosmetic and cosmeceutical formulations. 3. Identify the specific conditions required to formulate a tailored Unani cosmetic and cosmeceutical product and prepared them accordingly.	

Unit 1 Formulation of skin care products جلد کی نگہداشت کیلیے مصنوعات کی تیاری

28.1.1: Introduction and Classification تعارف اور درجہ بندی

28.1.2: Additives used in the Skin Care Formulations جلد کی نگھداشت کی مصنوعات میں اضافی اشیاء کا استعمال

28.1.3: Ghāza، Ghāliya، Ubtan، Ābiyāt, Ḍimād, Tilā', Adhān, Ghasūl, Marham, Ghamza, Nawra غازہ، غالیہ، ابٹن، آبیات، ضماد، ظلاء، ادھان، غسول، مرہم، غمزہ، نورہ

28.1.4: Face wash, Face serum, Cream, Body lotion, Scrub, Body oil, Sunscreen فیس واش، فیس سیرم، کریم، باڈی لوشن، اسکرب، باڈی آئل، سن اسکرین

References: 12,42,48,52,56,57,58,59,60,61,62,74,89,94,104,105,106,113,116,127,132,150,161

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Define and classify the skin care products	4	Lecture	CC	Knows-how	L&PPT ,L
CO1,CO2	Formulate different categories of skin care products	8	Practical28.1	PSY-MEC	Shows-how	PT,TBL,D
CO1,CO2, CO3	Identify the methodology to formulate different skin care product	10	Experiential-Learning28.1	AFT-CHR	Does	DA,PT,PrBL,D

Unit 2 Formulation of hair care products بالوں کی نگہداشت کیلئے مصنوعات کی تیاری

28.2.1: Shampoo, Medicated hair oils, Khiḍāb (Hair dyes) شیمپو، دھن طبی برائے شعر، خضاب

References: 12,48,56,57,58,59,62,74,89,94,104,105,106,113,120,127,132,161

3A	3B	3C	3D	3E	3F	3G
CO1,CO2	Describe the process of preparation of hair care products	2	Lecture	CC	Knows-how	L,L&PPT

CO1,CO2, CO3	Formulate different categories of hair care products	4	Practical28.2	PSY-MEC	Shows-how	DIS,PT,D
CO1,CO2, CO3	Analyse the methodology to formulate different hair care product	5	Experiential-Learning28.2	AFT-CHR	Does	DA,PrBL,SDL

Unit 3 Formulation of oral care products دھر کی نگہداشت کیلئے مصنوعات کی تیاری

28.3.1: Toothpaste, Sanūn (tooth powder), Mouth wash, Ghargharah(Gargle), Oral gel, Mouth fresheners ٹوتھ پیسٹ،ٹوتھ پاوڈر،غرغرہ،اورل جیل،ماوتھ فریشنر

References: 12,48,61,89,94,113,161

3A	3B	3C	3D	3E	3F	3G
CO1,CO2, CO3	Describe the process of preparation of oral care products	2	Lecture	CC	Knows-how	L,L&PPT
CO1,CO2, CO3	Formulate different categories of oral care products	4	Practical28.3	PSY-GUD	Shows-how	DL,D,PT
CO1,CO2, CO3	Demonstrate the methodology to formulate different oral care product	6	Experiential-Learning28.3	PSY-SET	Does	PrBL,FV,D

Unit 4 Formulations of colour cosmetic products متلون تزئینیاتی مصنوعات کی تیاری

28.4.1: Kājal, Surma, Eye shadows, Lipsticks, Tints (Lip Tints and Cheek Tints) کاجل،سرمہ،آئی شیڈو،لپ اسٹک،،لپ ٹنٹس،چیک ٹنٹنٹس

References: 12,48,61,89,94,120

3A	3B	3C	3D	3E	3F	3G
CO1,CO2, CO3	Describe the process of preparation of colour cosmetic products	2	Lecture	CC	Knows-how	L,L&PPT

CO1,CO2, CO3	Formulate different categories of colour cosmetic products	4	Practical28.4	PSY-MEC	Shows-how	D,PT,PAL
CO1,CO2, CO3	Illustrate the methodology to formulate different colour cosmetic product	5	Experiential-Learning28.4	AFT-CHR	Does	W,PrBL

Practical Training Activity

Practical Training 28.1 Formulation of lotions, face packs, creams by using Unani principles.

(Total duration of Activity 08 hours)

1. Teachers should provide ingrdients for various skin care products, ensuring students follow proper formulation techniques. (01 hour)

2. Students will formulate products such as lotions,/ face packs / creams using Unani principles.

(Processing of ingrdients and excipients - 04 hour and formulation development - 03 hour)

Practical Training 28.2 Formulation of hair oil, shampoos, and conditioners using traditional Unani recipes.

(Total duration of Activity 04 hours)

Teachers should describe the use of different Unani herbs for hair care, guiding students through preparation and testing. (01 hour)

Students will formulate hair oils, shampoos, and conditioners using traditional Unani recipes. (03 hours)

Practical Training 28.3 Preparation of toothpaste or mouthwashes using Unani ingredients

(Total duration of Activity 04 hours)

1. Teachers will demonstrate the preparation of oral care products and desribe the properties of key ingredients. (01 hour)

2. Students will prepare toothpaste or mouthwashes using Unani ingredients. (03 hours)

Practical Training 28.4 Formulation of Kohl (Surma), and natural blushes
(Total duration of Activity 04 hours) 1. Teachers should guide the students through formulation techniques ensuring correct ratios of ingredients and base. (01 hours) 2. Students will formulate Kohl (Surma), and natural blushes under teacher's supervision. (03 hours)
Experiential Learning Activity
Experiential-Learning Learning 28.1: **Product Testing & Feedback**
(Total duration of Activity 10 hours) Students shall describe the methodology to formulate different skin care product and ensure ethical guidelines are followed while product formulation. (02 hours) Students will test their formulations on volunteers (with consent) and gather feedback on texture, scent, and efficacy. (06 hours) Students must document the testing process and feedback received. (02 hours)
Experiential-Learning Learning 28.2: **Hair care Product analysis**
(Total duration of Activity 05 hours) 1. Students shall design a protocol to analyse hair care produc ts and record the results as per teacher's instruction . (01 hour) 2. Students will formulate and analyse a hair care product physico-chemically. (04 hours)
Experiential-Learning Learning 28.3: **Market Survey on Oral Care Products**
(Total duration of Activity 06 hours) 1. Students shall design a survey, collect data, and analyze results for presentation. (01 hours))

2. Students will conduct a survey on the effectiveness of Unani oral care products in comparison to commercial ones. (05 hours)
Experiential-Learning Learning 28.4: **Kuhl Preparation Workshop**
(Total duration of Activity 05 hours) 1. Student will participate in a workshop and ensure the safety and hygiene protocols for Surma production. (02 hours) 2. Students will attend a workshop on preparing traditional Kohl (Surma) and study its health benefits in Unani medicine and prepare surma. (03 hours)
Modular Assessment

Assessment	**Hour**
Instructions- Conduct a structured Mo/dular 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 6 C. The Modular Assessment can be done from any of the following Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks) Or Assessment and evaluation of published paper on a particular topic (50 Marks) Or	4

Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Semester No : 4

Module 29 : Regulatory Framework for Unani Drugs قوانین وضوابط برائے یونانی ادویہ

Module Learning Objectives

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

1. Describe a comprehensive understanding of the principles and importance of The Drug and Cosmetic Act-1940 and The Drug Rules, 1945 in the context of Unani drugs

2. Conduct ethical practices and adhere to ethical guidelines and standards in the development, testing, and marketing of Unani drugs.

3. Identify the required documentation for the registration and approval of pharmacies involved in production and sale of Unani drugs and cosmetics.

Unit 1 The Drug and Cosmetic Act-1940 1940–1940 ڈرگ اینڈ کاسمیٹکس ایکٹ

29.1.1: Introduction تعارف

29.1.2: Chapter I: Definitions of Unani Drugs Section 3(a), 3 (a) باب اول: یونانی ادویہ کی تعریف سیکشن Definition of Unani Patent or Proprietary Medicine under Section 3(h) 3(h): یونانی پیٹنٹ یا ملکیتی دوا کی تعریف سیکشن

29.1.3: Chapter IV A, Chapter V باب IV A , باب V

29.1.4: Schedule I: Authoritative books of Unani Medicine شیڈول I: یونانی طب کی مستند کتابیں

References: 18,24,32,37,39,40,44,45,47,49,51,54,68,69,75,78,85,97,100,101,102,110,112,141,158,164,168

3A	3B	3C	3D	3E	3F	3G
CO4,CO7	Describe Unani drugs and Unani proprietary medicine and list the authoritative books and explain technical matters related to drugs of Unani System of Medicine	2	Lecture	CC	Knows-how	L&PPT

CO4,CO7	Discuss technical matters related to drugs of Unani System of Medicine	3	Lecture	CAP	Knows-how	L&PPT
CO4,CO7	Appraise Drug and Cosmetic Act-1940 to Unani Pharmacies	10	Experiential-Learning29.1	AFT-CHR	Does	PrBL

Unit 2 The Drug Rules, 1945 - 1945ڈرگ رولس

29.2.1: Part XVI and XVI-A to Part XIX (Relevant provisions of Unani Medicine under Rule 151-170) (170–151یونانی طب کے متعلقہ احکام-ماتحت ضوابط) XIX -A، پارٹ XVI-A و XVI پارٹ

29.2.2: Guidelines for Issue of Licences: لائسنس کا اجراء اور اس کے اصول Classical Unani Drugs, Classical Unani Drugs with changed dosage forms,Classical Unani Drugs with New Indication, Patent or Proprietary Unani Medicine, Unani Health Promoters, Unani Cosmetics, Medicinal Plant Extract کلاسیکل یونانی دوائیں،یونانی اشکال ادویہ میں تبدیلی یونانی دواوں کے نئے خواص پیٹنٹ یا ملکیتی یونانی دوائیں،، صحت کو فروغ دینے والی یونانی مصنوعات یونانی تزئینیات، نبات سے حاصل شدہ عصارہ جات

29.2.3: Schedule E1: Poisonous substances of Unani Medicine شیڈول E-1: یونانی سمی مواد ادویہ

References: 18,24,32,37,39,40,44,45,47,49,51,54

3A	3B	3C	3D	3E	3F	3G
CO4,CO7	Describe manufacture and sale of Unani drugs and describe the rules of licensing procedure of manufacturing, sale, and testing of drugs	2	Lecture	CC	Knows-how	L&PPT
CO4,CO7	Discuss about the Govt. Analyst, Inspectors & Pharmacopoeial laboratory and list the poisonous substances of Unani system of medicine	1	Lecture	CAP	Knows-how	L&PPT
CO4,CO7	Illustrate The Drug Rules, 1945 to Unani Pharmacies	10	Experiential-Learning29.2	AFT-CHR	Does	FV,FC,DIS,PrBL

Unit 3 Good Manufacturing Practices(GMP) of Unani Drugs صنعت جیدہ برائے یونانی دواسازی

29.3.1: Schedule T of Drugs Rules, 1945 Tڈرگس رولس1945شیڈول

29.3.2: Schedule TA of Drugs Rules, 1945 TAڈرگس رولس1945شیڈول

References: 8,31,53,77,83,88,110,172

3A	3B	3C	3D	3E	3F	3G
CO4,CO7	Describe rules regarding Good Manufacturing Practices (GMP)	2	Lecture	CC	Knows-how	L&PPT
CO4,CO7	Analyze the quality control measures and documentation required under GMP guidelines for Unani drugs manufacturing.	8	Practical29.1	PSY-ADT	Shows-how	PrBL,FV,SDL,TPW
CO4,CO7	Identify the essential requirements to establish the GMP certified Unani drugs industry	8	Practical29.2	PSY-SET	Shows-how	PER,TPW,SDL,FV,PrBL
CO4,CO7	Appraise the GMP Rules, to Unani Pharmacies	10	Experiential-Learning29.3	AFT-CHR	Does	PL,TPW,D,FV,TUT

Practical Training Activity

Practical Training 29.1 Documentation Review for In-House Quality Control Lab under GMP Guidelines

(Total duration of Activity 08 hours)

1. Teachers will facilitate the practical by providing students with access to a GMP-certified Unani manufacturing unit's documentation. Prepare a guided template that outlines specific areas for students to focus on during their review, including key quality control measures and their relevance to GMP compliance. Encourage group discussions and presentations based on their findings to foster critical thinking and collaborative learning. If possible, invite a quality control expert from the unit to provide insights and answer student queries during the practical session. (03 hours)

Students will engage in a comprehensive review of the quality control measures and documentation practices implemented in the In-House Quality Control Lab of a GMP-certified Unani manufacturing unit. They will examine essential documents such as Standard Operating Procedures (SOPs), Quality Control (QC) records, and batch production records. Students will analyze the documentation related to testing methods, equipment calibration, and personnel training records to understand how these elements contribute to maintaining quality standards and regulatory compliance in Unani drug manufacturing. (05 hours)
Practical Training 29.2 **Essential requirements to establish the GMP-certified Unani drugs industry** **Field Visit**
(Total duration of Activity 08 hours) 1. Teachers will explain the GMP framework. (01 hour) 2. Students will collect the different formats for application of Good Manufacturing Practices (GMP) Certificate. (01 hour) 3. Students will prepare a checklist of GMP (Good Manufacturing Practices) requirements for a Unani drug manufacturing unit/ Field visit to a GMP certified pharmacy. (06 hours)
Experiential Learning Activity
Experiential-Learning Learning 29.1: Presenation / Poster presentation Pharmacy Visit
(Total duration of Activity 10 hours) 1. Students will visit a Pharmacy Unit, to observe real-time operations under the guidance of the teacher. A follow-up discussion and feedback will be conducted to reinforce learning. (02 hours) **2. Presentation / Poster Presentation:** Students will prepare and present on a specific chapter of the Drugs and Cosmetics Act of 1940, focusing on its implications for Unani drugs. (02 hours)

3. Pharmacy Visit:

Students will visit a section of any Unani pharmacy/ in-house Unani pharmacy/ hospital pharmacy. (06 hours)

Experiential-Learning Learning 29.2: **Presentation / Poster Presentation**

Pharmacy Visit

(Total duration of Activity 10 hours)

1. Student will prepare a powerpoint presentation on different chapters rules and schedules of Drugs and Cosmetics Act. Teacher will arrange a pharmacy visit, encouraging students to observe real-time operations. A follow-up discussion and feedback will be conducted to reinforce learning. (02 hours)

2. Presentation / Poster Presentation:

Students will present on a specific Chapter/Rules of the Drugs and Cosmetics Act 1940 & Rules 1945, focusing on its implications for Unani drugs industries. (02 hour)

3. Pharmacy Visit:

Students will visit a Unani pharmacy/in-house Unani pharmacy/ hospital pharmacy. (06 hour)

Experiential-Learning Learning 29.3: **Visit to GMP Compliance Unit.**

(Total duration of Activity 10 hours)

1. Student will organise a workshop on GMP under the guidance of teacher for assessing compliance with GMP. (02 hour)

2. Students will visit a GMP-certified facility to observe GMP Compliance. (08 hour)

Modular Assessment

Assessment	**Hour**

Instructions- 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 6 C. The Modular Assessment can be done from any of the following Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Module 30 : Other regulatory provisions in relation to Unani Drugs یونانی ادویہ کے حوالے سے دیگر قانونی ضوابط

Module Learning Objectives

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

1. Describe a comprehensive understanding of the principles and importance of other regulation in relation to Unani drugs
2. Conduct effective navigation and comply with the other regulatory frameworks governing Unani drugs at national level.
3. Identify the complex regulatory environment surrounding Unani drugs, ensuring their safe, effective, and ethical use in healthcare.

Unit 1 Introduction of other regulatory provisions in relation to Unani Drugs یونانی فارمیسی کے حوالے سے مخصوص قوانین کا تعارف

30.1.1: The Drug and Magic Remedies (Objectionable Advertisements) Act, 1954 and Rules, 1955 1955، 1954 اور قواعد، دواؤں اور جادوئی علاج (قابل اعتراض اشتہار کا قانون)

30.1.2: The Narcotic Drugs and Psychotropic Substances Act, 1985 [Only the matters related with medicinal Opium] 1985، نشہ آور ادویات اور متقلب نفسی مواد کا قانون (صرف طبی افیون سے متعلقہ امور)

30.1.3: The Medicinal and Toilet Preparations (Excise Duties) Act, 1955 [Only the matters related with Unani drugs] 1955، کا قانون (ایکسائز ڈیوٹیز) طبی اور مصنوعات زینت و آرائش پر محصول (صرف یونانی دواؤں سے متعلق امور)

References: 8,39,53,69,100,157,158,159,164,169

3A	3B	3C	3D	3E	3F	3G
CO4,CO7	Describe the other regulatory provisions in relation to Unani Drugs in India.	4	Lecture	CC	Knows-how	L&PPT ,L&GD
CO4,CO7	Describe the relevant sections of provisions of the Drug and Magic Remedies (Objectionable Advertisements) Act, 1954, Narcotic Drugs and Psychotropic Substances Act, 1985, pertaining to medicinal opium and identify the excise duty regulations in the Medicinal and Toilet Preparations (Excise Duties) Act, 1955, related to Unani drugs.	6	Lecture	CC	Knows-how	L&PPT ,L&GD
CO4,CO7	Discuss the impact of the Drug and Magic Remedies (Objectionable Advertisements) Act, 1954, on the marketing and promotion of Unani drugs.	8	Practical30.1	PSY-SET	Shows-how	DIS,TPW,PL,FC
CO4,CO7	Evaluate the Excise Duties Act, 1955, and its role in the taxation and regulation of medicinal and toilet preparations in Unani drugs	7	Practical30.2	PSY-SET	Shows-how	PAL,DIS,TPW,PrBL
CO4,CO7	Discuss the provisions of the Narcotic Drugs and Psychotropic Substances Act, 1985, concerning the use of medicinal opium in Unani formulations.	5	Practical30.3	PSY-SET	Shows-how	DIS,FC,PL,PER,PrBL
CO4,CO7	Identify the necessary precautions and compliance measures required during the manufacturing process of Unani drugs to avoid legal and regulatory violations.	9	Experiential-Learning30.1	AFT-RES	Does	TPW,DIS,PrBL,FV,PER

CO4,CO7	Interpret the provisions of the Biological Diversity Act, 2002, and its impact on the sourcing of raw materials for Unani drugs.	8	Experiential-Learning30.2	AFT-CHR	Does	PAL,TPW,FV,PER,DIS
CO4,CO7	Assess the challenges and implications of adhering to multiple regulatory provisions within the Unani pharmaceutical industry.	9	Experiential-Learning30.3	AFT-VAL	Does	PAL,D,W,TBL,PrBL

Practical Training Activity

Practical Training 30.1 Analysis of Drug and Magic Remedies (OA) Act, 1954 Cases

(Total duration of activity 8 hours)

Teacher provides case studies or real-world examples of non-compliant advertisements and ask students to present the outcomes and alternative compliant strategies. (2 hours 30 min)

Students will review case studies related to violations of the Drug and Magic Remedies (Objectionable Advertisements) Act, 1954. They will analyze how these cases affected marketing and promotion strategies for Unani drugs and present their findings. (5 hours 30 min)

Practical Training 30.2 Review of Excise Duties Act, 1955

(Total duration of activity 7 hours)

The teacher will provide a list of Unani formulations containing the ingredients that come under the Excise Act. (1 hour)

Students will evaluate how the Excise Duties Act, 1955, is applied to medicinal and toilet preparations in Unani drugs. They will calculate tax for specific Unani products based on the act’s provisions. (3 hours)

Students reviewed different products and discuss their implications.(3 hours)

Practical Training 30.3 Review of Narcotic Drugs and Psychotropic Substances Act, 1985

(Total duration of activity 5 hours)

Teacher provides students with relevant sections of the NDPS Act and sample documentation required for legal opium usage. Ask them to draft a mock application for obtaining such permission. (2 hours) Students will review provisions of the NDPS Act, 1985, and assess its impact on the use of medicinal opium in Unani formulations. They will also examine the processes for obtaining permission to use medicinal opium (3 hours)
Experiential Learning Activity
Experiential-Learning Learning 30.1: Compliance Audit of Manufacturing Process
(Total Duration of Activity 9 hours) Student shall invite an industry expert to describe the critical compliance measures in the Unani drug manufacturing process. Follow up with a class discussion. (3 hours) Students will participate in an on-site visit or virtual tour of a Unani pharmaceutical manufacturing unit/In-house Pharmacy to identify compliance measures and precautions taken to avoid legal and regulatory violations.(6 hours)
Experiential-Learning Learning 30.2: Raw Material Sourcing and the Biological Diversity Act
(Total duration of activity 8 hours) Student will visit to a herbal garden or raw material supplier to know the Biological Diversity Act impacts sourcing. Discuss sustainable practices for sourcing and legal restrictions. (4 hours) Students will explore fieldwork to study the sourcing of raw materials for Unani drugs in compliance with the Biological Diversity Act, 2002. They will identify restrictions on harvesting certain plants. (4 hours)
Experiential-Learning Learning 30.3: Workshop on regulatory Audit in Unani Pharmacy

(Total duration of activity 9 hours)

Students will Organize a workshop where they are divided into teams, acting as regulatory auditors. They will review compliance documents and processes, identify potential violations, and propose corrective measures. Conduct a debrief session to review findings. (3 hours)

Students simulate a regulatory audit in a Unani pharmacy, focusing on compliance with multiple regulatory provisions such as the Drug and Magic Remedies Act, NDPS, Excise Duties Act, and Biological Diversity Act. (6 hours)

Modular Assessment

Assessment	Hour
Instructions- 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 6 C. The Modular Assessment can be done from any of the following Practical and Demonstrations (50 Marks) Or Analysis of assigned project work and report (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Semester No : 5

Module 31 : Intellectual Property of Unani Drugs یونانی دوائیں اور حق انشوری

Module Learning Objectives

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

1. Describe various aspects of intellectual property rights in relation to Unani medicine.

2. Conduct research and do development by utilizing IP databases and resources in Unani medicine.

3. Identify the appropriate IP protection mechanisms for different drugs of Unani medicine.

Unit 1 Intellectual Property Rights [IPR] حقوق ملکیت دانشوری،

31.1.1: Introduction تعارف

31.1.2: Types of Intellectual Property Rights: حق ملکیت دانشوری کی اقسام Trademarks, Copyrights, Trade secrets, industrial designs, geographical indications تجارتی نشان، حق نقل و اشاعت، تجارتی راز، صنعتی ڈیزائنز، جغرافیائی نشانات

References: 70,72,144,160

3A	3B	3C	3D	3E	3F	3G
CO2,CO3, CO4	Describe types of Intellectual Property Rights	5	Lecture	CC	Knows-how	L&PPT ,L&GD,TUT
CO2,CO3, CO4,CO7	Develop the ability to create educational materials and presentations to raise awareness about IPR in Unani medicine.	10	Practical31.1	CS	Shows-how	PrBL,PER,FC,D,DIS
CO2,CO3, CO4,CO7	Demonstrate a strong appreciation for the role of IP rights in the preservation and innovation of Unani medicine	7	Experiential-Learning31.1	AFT-CHR	Does	PER,PrBL,D,PAL,FC
CO2,CO3, CO4,CO7	Analyse the impact of Intellectual Property Rights on the commercialization and global market accessibility of Unani medicinal products.	6	Experiential-Learning31.2	CAN	Does	TPW,SDL,D,PER,DIS

Unit 2 Patent Laws related to Unani drugs یونانی ادویہ سے متعلق اجازہ تحفظ کے قوانین

31.2.1: The Patents Act, 1970 and its role in Intellectual Property Protection پیٹنٹس ایکٹ1970اور دانشورانہ ملکیت کے تحفظ میں اس کا کردار

31.2.2: The Process of Patent Filing and Registration پیٹنٹ کی درخواست اور رجسٹریشن کا عمل

References: 17,51,70,72,81,82,95,99,160,164

3A	3B	3C	3D	3E	3F	3G
CO3,CO4, CO7	Describe the Patent Act-1970 and its role in IPR	5	Lecture	CC	Knows-how	L&GD,L&PPT
CO3,CO4, CO7	Develop the skill to accurately draft patent applications for Unani drug formulations, processes, and products.	10	Practical31.2	PSY-GUD	Shows-how	D,DIS,PER,BS,PrBL
CO3,CO4, CO7	Raise IP Awareness by developing and deliver educational materials and presentations on IP rights and management.	7	Experiential-Learning31.3	AFT-VAL	Does	DIS,PER,D,TPW,PAL
CO3,CO4, CO7	Analyze the ethical challenges associated with patenting traditional knowledge and Unani formulations.	6	Experiential-Learning31.4	CAN	Does	DIS,PER,RP,D,TPW

Practical Training Activity

Practical Training 31.1 Awareness about Intellectual Property Rights (IPR) of Unani medicine

(Total duration of activity 10 hours)

Teachers should organise a workshop or lectures on legal framework of IPR and encourage creativity in designing awareness materials. (7 hours)

Students will attend the workshop and prepare an assignment or power point presentation about the IPR and discuss it in groups. (3 hours)

Practical Training 31.2 Patent application for a Unani drug

(Total dsuration of activity 10 hours) Teachers should guide students through the structure of a patent application and provide examples of existing patents for reference. (3 hours) Students will draft a mock patent application for a Unani drug.(7 hours)
Experiential Learning Activity
Experiential-Learning Learning 31.1: Educational material about Intellectual Property Rights (IPR) in Unani medicine
(Total duration of activity 7 hours) Students will create educational material about Intellectual Property Rights (IPR) in Unani medicine, focusing on raising awareness in the Unani community under the guidance of a teacher. Teachers should guide students on the legal framework of IPR.
Experiential-Learning Learning 31.2: Case Study on Trademark (TM) Filing and Global Market Accessibility
(Total duration of activity 6 hours) Students will explore real-world cases where Unani medicinal products were commercialized and globally accessible through proper Intellectual Property Rights (IPR) registration, especially focusing on trademarks. Discuss the process of trademark registration and how it helps protect a product's identity, commercialization, and accessibility. Conduct a session on the practical steps for registering a trademark and global IPR strategies. They will analyze how trademark filing impacted the products' market entry and protection from infringement. The teacher will help them in finding examples of Unani products that successfully filed for trademarks and entered global markets.
Experiential-Learning Learning 31.3: Workshop on Patent Search and Analysis
(Total duration of activity 7 hours) Students will go through the patent databases and identify existing patents in the field of Unani medicine and analyse them. The teacher will encourage them to analyze and understand the scope of these patents.
Experiential-Learning Learning 31.4: **Workshop on Ethical Considerations in Patenting Traditional Knowledge**

(Total duration of activity 6 hours)

1. Students will gather relevant case studies on patenting traditional knowledge and prepare a presentation outlining key concepts and ethical considerations under the supervision of teacher. Students make small groups for case analysis and facilitate role-playing exercises that represent various stakeholder perspectives. Conclude with a debriefing session for students to present their findings and proposed guidelines, fostering discussion and feedback on their analyses. (3 hours)

2. Students will analyze the ethical challenges of patenting traditional knowledge and Unani formulations through case studies and role-playing exercises. They will discuss real-world scenarios that highlight the impacts on indigenous knowledge systems and collaborate to develop ethical guidelines that balance innovation with respect for traditional practices. (3 hours)

Modular Assessment

Assessment	**Hour**
Instructions- 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 6 C. The Modular Assessment can be done from any of the following Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks) Or Assessment and evaluation of published paper on a particular topic (50 Marks) Or	4

Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Module 32 : Pharmacovigilance and use of Artificial Intelligence in Unani Pharmacy (فارماکوویجلنس اور یونانی فارمیسی میں مصنوعی ذہانت کا استعمال)

Module Learning Objectives

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

1. Describe the importance of ensuring the safety, efficacy, and quality of Unani drugs.

2. Conduct safety Monitoring of Unani drugs

3. Identify the processes involved in pharmacovigilance and role of artificial intelligence in Unani pharmacy development and management.

Unit 1 Pharmacovigilance and Safety Monitoring تاثیر ادویہ اور بحفاظت استعمال کی نگہبانی

32.1.1: Adverse Drug Reactions (ADR) Monitoring for Unani Medicines یونانی دواؤں کے منفی رد عمل کی نگرانی

32.1.2: Regulations related to Pharmacovigilance in Unani System of Medicine یونانی طب میں تاثیر ادویہ کی نگرانی سے متعلق قواعد وضوابط

References: 13,14,50,80,103,111,124,129,131,152,166,167

3A	3B	3C	3D	3E	3F	3G
CO8	Describe adverse drug reactions and elucidate regulations related to pharmacovigilance in Unani System of Medicine.	5	Lecture	CC	Knows-how	L&GD,L&PPT
CO8	Document and report adverse events associated with Unani drugs.	10	Practical32.1	PSY-GUD	Shows-how	ML,FV,D,PER,DIS
CO8	Appraise the data management system related to the safety of Unani drugs	6	Experiential-Learning32.1	AFT-VAL	Does	PER,DIS,TUT,IBL,D

CO8	Evaluate the challenges and limitations in pharmacovigilance specific to Unani medicines and propose potential improvements to enhance safety monitoring.	7	Experiential-Learning32.2	CE	Does	PER,SDL,TPW,D,W

Unit 2 Role of Artificial Intelligence in Unani Pharmacy یونانی فارمیسی میں مصنوعی ذہانت کا کردار

32.2.1: Role of Artificial Intelligence: Manufacturing, Marketing, Pharmacovigilance دواسازی، مارکیٹنگ اور تاثیر ادویہ کی نگرانی میں مصنوعی ذہانت کا کردار

References: 10,13,16,43,46,73,79,84,86,87,91,96,117,123,134,135,139

3A	3B	3C	3D	3E	3F	3G
CO2	Describe Artificial Intelligence (AI) fundamentals and its application in Unani Pharmacy	5	Lecture	CAP	Knows-how	L&PPT ,L&GD
CO2	Demonstrate proficiency in using various AI software and tools relevant to Unani pharmacy.	10	Practical32.2	PSY-GUD	Shows-how	PER,W,D,PrBL,DIS
CO2	Collect, manage, and analyse manufacturing, marketing and safety data of Unani drugs using AI tools	7	Experiential-Learning32.3	AFT-CHR	Does	D,DIS,SIM,SDL,W
CO2	Integrate AI-driven predictive models to identify potential risks and benefits in the formulation and usage of Unani drugs, ensuring optimized safety and efficacy.	6	Experiential-Learning32.4	CAP	Does	D,PER,FC,EDU,W

Practical Training Activity

Practical Training 32.1 Documenting and reporting adverse drug reactions (ADR).

(Total duration of activity 10 hours)

Teachers should describe the importance of pharmacovigilance and ADR reporting and provide case studies for students to document. (2 hours)

Students will practice documenting and reporting adverse drug reactions (ADR) in a simulated setting using a template. (8 hours)

Practical Training 32.2 Data Analysis by using Artificial Intelligence Tools (e.g., predictive modeling software)
(Total duration of activity 10 hours) Teachers should introduce students to AI tools used in pharmaceutical research and guide them through exercises and simulations. (2 hours) Students will explore artificial intelligence tools (e.g., predictive modeling software) to analyze data related to Unani drug efficacy and safety. They will document and present their fiondings. (8 hours)
Experiential Learning Activity
Experiential-Learning Learning 32.1: **ADR Case Study Analysis**
(Total duration of activity 6 hours) Students will analyze ADR cases from Unani drugs and suggest improvements in monitoring through a powerpoint presentation. They will do discussions on how to improve pharmacovigilance in Unani medicine.
Experiential-Learning Learning 32.2: Workshop on Pharmacovigilance Challenges
(Total duration of activity 7 hours) Students will do agroup discussions on relevant case studies of adverse drug reactions related to Unani medicines.They will identify challenges and limitations in the current pharmacovigilance system and propose strategies for improvement. Teacher will helps them to organise a workshop and encourage students to present their findings and recommendations at the end of the workshop.
Experiential-Learning Learning 32.3: **AI Application in Drug Discovery**
(Total duration of activity 7 hours) Students should present case studies for AI-based drug discovery,software usage, and evaluate their outcomes under the supervision of teacher. Students will work in teams to apply AI tools in a simulated drug discovery process for Unani formulations.
Experiential-Learning Learning 32.4: Online Seminar on role of AI in Unani Medicine

(Total duration of activity 6 hours)

Students will organize and/or participate in an online seminar featuring experts in AI and pharmacy who will deliver lectures and discuss the integration of AI-driven predictive models in Unani drug safety and efficacy. Students will learn about current advancements and engage in Q&A sessions.

Modular Assessment

Assessment	Hour
Instructions- 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 6 C. The Modular Assessment can be done from any of the following Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks) Or Assessment and evaluation of published paper on a particular topic (50 Marks) Or Field visit report and its learning outcomes (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Semester No : 6

Module 33 : Unani Pharmaceutical Management یونانی صنعت دواسازی کی تنظیم،

Module Learning Objectives

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

1. Describe strategies of procurement and inventory management alongwith quality assurance

2. Conduct the measures, procurement, storage, packaging, and quality control of finished products

3. Identify the strategies of pharmaceutical management to solve complex business problems

Unit 1 Material Management مواد کا نظم

33.1.1: Procurement and Inventory management: Raw material, packaging material, and Finished goods خریداری اور انوینٹری مینجمنٹ: خام مال پیکجنگ مواد، اور تیار شدہ مصنوعات

References: 11,23,31,53,55,77,83,88,90,109,147,150,162,163,172

3A	3B	3C	3D	3E	3F	3G
CO6,CO7	Describe procurement of raw material and inventory management of Unani Pharmacy	5	Lecture	CC	Knows-how	L&PPT ,L_VC,L
CO2,CO6	Demonstrate the proper techniques for cleaning, drying, and storing raw materials and finished goods to maintain their potency and efficacy.	10	Practical33.1	PSY-GUD	Shows-how	EDU,DIS,FV,D
CO2,CO6	Analyse the material management process to the Unani pharmacies	7	Experiential-Learning33.1	AFT-CHR	Does	FV,PER,DIS,D
CO2,CO6	Demonstrate the ability to assess and optimize material flow and resource utilization to minimize waste and ensure efficient operations in Unani pharmaceutical management.	7	Experiential-Learning33.2	AFT-CHR	Does	PER,TBL,DIS,D,FV

Unit 2 Quality Management نظم اوصاف

33.2.1: Quality Control: Cultivation, Collection, Identification, Storage, Drying, Processing, In- process quality control, Finished products, Distribution زراعت وذخیرہ اندوزی، شناخت، جمع آوری، تجفیف، اعمال دواسازی، ترکیب ادویہ کے مراحل اور ضبط اوصاف برائے تیار شدہ مصنوعات اور ان کی فراہمی

References: 5,8,11,23,28,31,42,53,60,61,76,90,98,147,149,150,169,171,172

3A	3B	3C	3D	3E	3F	3G
CO5,CO7	Describe the concepts of quality assurance, quality control, and quality management and understand the significance of maintaining high-quality standards in Unani Pharmacy	5	Lecture	CC	Knows-how	L&GD,L&PPT
CO5,CO7	Demonstrate the components of a quality management system (QMS) and its implementation.	10	Practical33.2	CAP	Shows-how	PrBL,PER,D,FV,DIS
CO5,CO7	Acquire skills in cultivating and collecting medicinal plants	6	Experiential-Learning33.3	PSY-GUD	Does	D,PL,FV,PrBL,DIS
CO5,CO7	Analyse the regulatory requirements for quality management in Unani Pharmacy and propose methods for ensuring compliance with national and international standards.	6	Experiential-Learning33.4	CAN	Does	DIS,D,PER,W,RP

Practical Training Activity

Practical Training 33.1 Handling raw materials and finished products

(Total duration of activity 10 hours)

Teachers should demonstrate proper techniques of handling raw materials and finished products and allow students to practice with real samples under supervision. (2 hours)

Students will practice handling raw materials and finished products in a controlled environment, ensuring proper drying, cleaning, and storage techniques. (8 hours)

Practical Training 33.2 Quality Management System (QMS) plan for a Unani drug manufacturing unit
(Total duration of activity 10 hours) Teachers should explain QMS concepts and guide students through the steps to implement a mock system, using real-world examples. (2 hours 30 min) Students will create a mock Quality Management System (QMS) plan for a Unani drug manufacturing unit, including all essential components. (7 hours 30 min)
Experiential Learning Activity
Experiential-Learning Learning 33.1: **Field Visit to a Unani Drug Storage Facility**
(Total duration of activity 7 hours) Students will visit a certified Unani drug storage facility/In-House Hospital Pharmacy to observe professional methods of handling and storing Unani drugs and will discuss the visit in class to reinforce learning.
Experiential-Learning Learning 33.2: Simulation Exercise on Material Flow
(Total duration of activity 7 hours) Student will conduct a exercise on a simulated setup and data for material flow provided by the teacher. Here students can assess a fictional Unani pharmaceutical operation. They will analyze material flow and resource utilization, identify inefficiencies, and propose optimization strategies to minimize waste.
Experiential-Learning Learning 33.3: **QMS Workshop**
(Total duration of activity 6 hours) Students will attend a workshop organised by the teachers where professionals from the industry describe how to develop and maintain a QMS in a Unani drug facility. Students will do discussions and hands-on activities during the workshop.

Experiential-Learning Learning 33.4: Interactive Workshop on Quality Management	
(Total duration of activity 6 hours) Students will organise an interactive workshop focusing on regulatory requirements for quality management in Unani Pharmacy. They will serach and record case studies on quality management in Unani Pharmacy and discuss critically about the regulatory environment in quality management.	
Modular Assessment	
Assessment	**Hour**
Instructions- 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 6 C. The Modular Assessment can be done from any of the following Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks) Or Assessment and evaluation of published paper on a particular topic (50 Marks) Or Field visit report and its learning outcomes (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	4

Module 34 : Commercialization and Marketing of Unani drugs (یونانی دواوں کی تجارت اور خرید و فروخت)

Module Learning Objectives

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

1. Describe concepts of commercialization and marketing to ensure a consumer compliance

2. Conduct effective planning skills, including time management, resource management, delegation, and organization

3. Identify marketing techniques and their applications in the pharmaceutical industry.

Unit 1 Pharmaceutical Marketing of Unani drugs یونانی ادویہ کی مارکیٹنگ

34.1.1: Introduction and scope of Pharmaceutical Marketing تسویق دواسازی کا تعارف اور دائرہ کار

34.1.2: International Regulatory Compliance for Unani products یونانی مصنوعات کیلئے بین الاقوامی ضوابط

34.1.3: Digital Marketing and E-Commerce of Unani drugs یونانی ادویہ کی ڈیجیٹل مارکیٹنگ اور ای کامرس

References: 19,20,21,23,25,31,42,83,90,92,93,118,138,142,147,155,165

3A	3B	3C	3D	3E	3F	3G
CO2,CO4	Describe pharmaceutical marketing and describe its significance and unique aspects in the Unani medicine industry.	4	Lecture	CC	Knows-how	L&GD,L&PPT
CO2,CO4	Analyze regulatory requirements for Unani medicines across different countries	4	Experiential-Learning34.1	CAN	Does	SIM,CBL,DIS,PER,RP
CO2,CO4	Integrate digital marketing tools and set up an online store for Unani medicines.	5	Experiential-Learning34.2	PSY-MEC	Does	DIS,D,SIM,W

Unit 2 Advertisement and commercialization اشتہار اور فروغ کے دیگر ذرائع

34.2.1: Advertising and other forms of Promotion اشتہار اور فروغ تجارت کے دیگر ذرائع

34.2.2: Distribution Channels: Manufacturer, Wholesaler, Retailer, Hospital and Government agencies. فراہمی کے ذرائع: دواساز ہول سیلر، خوردہ فروش، ہسپتال اور حکومتی ادارے

34.2.3: Technology transfer of Unani products یونانی مصنوعات کی ٹیکنالوجی کی منتقلی

References: 7,9,22,23,25,26,27,35,36,41,42,107,114,143,145,150,151,154

3A	3B	3C	3D	3E	3F	3G
CO2,CO4	Describe advertising and explain its role and media types in the commercialization of Unani products.	3	Lecture	CC	Knows-how	L&PPT ,L&GD
CO2,CO4	Create and execute advertising campaigns highlighting the benefits of Unani products	10	Practical34.1	PSY-MEC	Shows-how	PrBL,BS,EDU,TPW,RP
CO2,CO4	Apply knowledge of distribution channels and strategies for Unani products and perform technology transfer activities toward commercial production.	8	Experiential-Learning34.3	CAP	Does	PER,D,BS,FV,RP

Unit 3 Pharmaceutical Entrepreneurship and Startups in Unani Medicine یونانی طب میں صنعت کار دواسازی و آغاز گری

34.3.1: Entrepreneurial opportunities in Unani pharmacy یونانی فارمیسی میں صنعت کاری کے مواقع

34.3.2: Startups, Cottage industries and other Government schemes for Unani entrepreneurs آغاز گری، کاٹیج انڈسٹری اور حکومت کی دیگر اسکیمیں

References: 25,29,33,81,82,130,136,142,146,156,170

3A	3B	3C	3D	3E	3F	3G
CO2	Describe entrepreneurial opportunities and identify market gaps in the Unani medicine sector	3	Lecture	CAN	Knows-how	L&PPT ,L&GD,BS
CO2	Identify government schemes and support systems for Unani pharmacy startups.	10	Practical34.2	AFT-REC	Shows-how	FC,PrBL,PL,SDL,LS

CO2	Develop business plans and analyze case studies to understand strategies for Unani pharmacy startups.	9	Experiential-Learning34.4	AFT-VAL	Does	PrBL,PL,W,SIM,IBL
Practical Training Activity						
Practical Training 34.1 Designing and execution of mock advertising matter for a Unani product, focusing on its unique benefits.						
(Total duration of activity 10 hours) Teachers should provide guidance on marketing strategies and encourage creativity in developing the advertising material, including digital and print ads and also organise a poster presentation. (3 hours) Students will design and execute a mock advertising matter for a Unani product, focusing on its unique benefits. Students will participate in a poster presentation to depict their advertising material. (7 hours)						
Practical Training 34.2 **Resources and schemes for startups**						
(Total duration of activity 10 hours) Teachers should provide a list of resources and help students access information on entrepreneurship support in Unani medicine. (2 hours) Students will research government schemes and support programs for Unani medicine startups and present their findings. (8 hours)						
Experiential Learning Activity						
Experiential-Learning Learning 34.1: **Regulatory requirements for Unani medicines in various countries**						
(Total duration of activity 4 hours) Students will research the regulatory requirements for registration of Unani drugs in different countries and compare them in a class presentation.						
Experiential-Learning Learning 34.2: **Workshop on Marketing Opportunities for Unani Drugs/International Regulatory Opportunities for Unani Drug Registration**						
(Total duration of activity 5 hours)						

Students will organise one or two lectures of experts on International Marketing Opportunities for Unani Drug and their registration's regulation under the guidance of teachers and do discussions and hands-on activities after the lecture.
Experiential-Learning Learning 34.3: **Brand Development Exercise**
(Total duration of activity 8 hours) Students will go through the resources on branding and marketing, and work in teams to develop a brand identity for a Unani product, including logo, tagline, and promotional materials.
Experiential-Learning Learning 34.4: **Business Plan Development**
(Total duration of activity 9 hours) Students will search and discuss the case studies of the business plan creation processes, and strategies. Thereafter, they will develop a business plan for a hypothetical Unani startup, including market analysis, funding requirements, advertisements and growth strategies.

Modular Assessment

Assessment	Hour
Instructions- 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 6 C. The Modular Assessment can be done from any of the following Analysis of assigned project work and report (50 Marks) Or Case-Based Evaluation (50 Marks)	4

Or Assessment and evaluation of published paper on a particular topic (50 Marks) Or Field visit report and its learning outcomes (50 Marks) Or Any practical in converted form can be taken for assessment. (25 Marks) and Any experiential, such as portfolios/ reflections/ presentations can be taken as an assessment. (25 Marks)	

Table 4 : Practical Training Activity

(*Refer table 3 of similar activity number)

Practical No*	Practical name	Hours
1.1	Size Reduction of Unani drugs	6
1.2	Size Separation of Unani drugs	6
1.3	Mixing & Homogenization of different forms of Unani Medicines	4
1.4	Drying of Unani Medicines	4
2.1	Clarification & Filtration of Unani drugs	6
2.2	Extraction of Unani drugs	6
2.3	Sterilization	4
2.4	Heating Processes	4
3.1	Dosage form designing	4
3.2	Disperse systems	6
3.3	Rheology	4
3.4	Bioavailability	2
3.5	Pharmaceutical pre-formulation	4
4.1	Novel drug delivery systems	4
4.2	Transdermal drug delivery system	4
4.3	Ocular & Nasal drug delivery systems	4
4.4	Pulmonary drug delivery system	4
4.5	Colon, Rectal & Vaginal drug delivery systems	4
5.1	Solid dosage forms	6
5.2	Liquid dosage forms	6

5.3	Semi solid dosage forms	4
5.4	Pharmaceutical aerosols	4
5.5	Modified-release dosage forms	6
5.6	Paediatric & Geriatric dosage forms	4
6.1	Bases and Vehicles	2
6.2	Permitted Colorants & Flavoring Agents	2
6.3	Permitted Preservatives	2
6.4	Alternate Sweeteners	2
6.5	Surfactants and Emulsifying Agents	2
7.1	Technological Advancements	2
7.2	Application of Nanotechnology in Unani Pharmaceutical Sciences	5
7.3	Bioinformatics in Unani Pharmaceutical Sciences	5
7.4	Computers in Unani Pharmaceutics	4
7.5	Artificial Intelligence (AI) in Unani Pharmaceutics	4
8.1	Packaging Material	2
8.2	Types of Packaging.	2
8.3	Materials in Packaging	4
8.4	Advancements in packaging	4
8.5	Production Management	8
9.1	Extrinsic and intrinsic factors that affect the quality of Unani drugs	2
9.2	Types and modes of adulteration in Unani drugs	4
9.3	Deliberate and accidental adulteration in Unani drugs	4
9.4	Macroscopic characterization of crude material as per classical Unani literature and pharmacopeia.	4

9.5	Suitable time of harvesting of Unani drugs	2
9.6	Compare monographs of drugs in different pharmacopoeia with UPI	2
9.7	Differentiate between the monographs of WHO, ESCOP and ICMR	2
10.1	Different solvents used in the extraction	2
10.2	Suitable method of extraction depending on the nature of the drug.	8
10.3	Fixed and volatile oils from the oils containing Unani drugs	6
10.4	Alcohol and Water soluble Extractive value of the given drug and Successive Extraction	4
11.1	Morphological characteristics of the given Unani drug	3
11.2	Total Ash value, acid insoluble ash value, water-soluble ash and Sulphated Ash of a given Unani drug.	5
11.3	Moisture content of a Unani drug by using the Gravimetric Method Moisture content of a Unani drug by using the Azeotropic Method (Toluene Distillation Method)	4
11.4	pH values of the given sample of drug	4
11.5	Solubility of Sodium Chloride in water (gravimetric method of estimation) 2. Specific gravity of honey	4
12.1	Viscosity of Arq using Ostwald's U tube viscometer	5
12.2	Refractive index and optical rotation of a given sample of Unani drug	3
12.3	Phytoconstituents in the given Unani drug: Alkaloids,Glycosides, Carbohydrates, Reducing and Non-Reducing Sugars, Phytosterols, Proteins and Free Amino Acids, Flavanoids, Saponins, Phenols, Gums and mucilage, Resins, and tannins.	6
12.4	Holde’s Test and Rancidity (Kreis Test)	6
13.1	Various types of chromatography	4
13.2	Thin Layer chromatography	5
13.3	High-Performance Thin Layer Chromatography	4
13.4	High-Performance Liquid chromatography	4

13.5	Gas chromatography on Unani drugs	3
14.1	Principle and working of Colorimetery	4
14.2	UV- Visible spectroscopy	4
14.3	Infrared (IR) spectroscopy	4
14.4	Applications of Flame emission spectroscopy in Unani Drugs	4
14.5	Application of Atomic absorption spectroscopy in Unani Drugs	4
15.1	Microbial limit test, total microbial count and tests for Specified Micro-organismsas per UPI	3
15.2	Test for Aflatoxins	2
15.3	Tests for pesticide residue in Unani drugs	2
15.4	Demonstrate the Limit Test for Heavy metals	3
16.1	Analytical specifications of Unani formulations viz. Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, Kushta	5
16.2	Factors affecting the Flow of Powders	2
16.3	Tests for Hardness, Weight Variation, Friability, and Disintegration rate on tablets/pills.	3
17.1	Shelf-life of Unani formulations as per D & C Act	3
17.2	Types of Stability Studies viz. Accelerated Stability, Long-term Stability, and Stress testing	5
17.3	ICH guidelines for stability testing	2
18.1	Istruments & equipments recommended for Chemistry, Pharmacognosy and Microbiology section in an In-house Quality control section	2
18.2	Elucidate the PART XVI (A) of Drugs Rules, 1945	2
18.3	Advanced Analytical Methods for analysis of Kushta viz. XRD (X-ray diffraction), AAS (Atomic absorption spectroscopy), TEM (Transmission Electron Microscopy), SEM (Scanning electron microscopy), FTIR (Fourier Transform Infrared Spectroscopy), TGA (Thermogravimetric analysis)	6
19.1	Practical Aspects of Animal Use in Research	6

19.2	Basic skills for working with experimental animals, in a simulated environment	6
19.3	Simulating Ethical Oversight: Understanding CPCSEA and IAEC in Practice	8
20.1	Comprehensive Crude Drug identification and classification	5
20.2	Identification, adulteration, substitution and pharmacological activity of Unani crude drugs.	5
20.3	Taxonomic characters of medicinal plants used in Unani medicine	4
20.4	Morphological and Anatomical Study of Medicinally Important Plant Families	6
21.1	Comprehensive Assessment and Management of Laboratory Animal Welfare	5
21.2	Rodent Handling, Administration, and Experimental design for animal studies	5
21.3	Strategic Selection, Handling, and Experimental Design of Non-Rodent Models	5
21.4	Physiology, Handling, and Pharmacological Applications of miscellaneous experimental models (Frog/ Pigeon / Zebrafish/ Chicken)	5
22.1	Comparative Morphology and Anatomy of Leaves, Flowers, Fruits & Seeds	5
22.2	Microscopic Observation and Identification of Cell Types and Ergastic Contents in Crude Drugs	5
22.3	Quantitative Microscopy for Identification and Standardization of Crude Drugs	5
22.4	Chemical and physical evaluation techniques for identification and quality assessment of crude drugs	5
23.1	Hands-on GLP.	3
23.2	Exploring Non-Animal Alternatives: A Case Study & Data Interpretation Workshop.	3
23.3	Dissection and Preparation of Isolated Muscle Tissues.	7
23.4	Functioning of Organ Bath and Langendorff Apparatus.	4
23.5	Isolated Tissue/Muscle Preparation.	3
24.1	Bioassay – Variability, Errors & Antagonism	6
24.2	Pain & Inflammation Assessment: Hot Plate /Tail-Flick/ Plethysmometer	7
24.3	Toxicity Studies Fundamentals	7

25.1	In-vivo analgesic, antipyretic and anti-inflammatory activities using Animal Simulation Software	5
25.2	Perform CNS behavioral tests such as Forced Swim Test (FST), Elevated Plus Maze (EPM), and Maximal Electroshock Seizure (MES) test. The session includes data recording, result interpretation, and understanding ethical handling of animals.	5
25.3	Hepatoprotective, and Nephroprotective studies using simulation methods.	5
25.4	Anti-diabetic and hypolipidemic studies using simulation methods	5
26.1	Identification of Alkaloid and Glycoside Containing Crude Drugs through Organoleptic and Chemical Tests.	5
26.2	Identification and Analysis of Fixed and Volatile Oils Using Chemical and Analytical Methods.	5
26.3	Identification, Extraction, and Testing of Gums and Resins.	5
26.4	Chemical Identification and Isolation Techniques of Tannins and Saponins.	5
27.1	Ingredients used in Unani Cosmetology	3
27.2	Classification and application of excipients	3
27.3	Extraction method of Itriyat (Perfumery and fragrances)	6
27.4	Process of cosmetic formulation and development	8
28.1	Formulation of lotions, face packs, creams by using Unani principles.	8
28.2	Formulation of hair oil, shampoos, and conditioners using traditional Unani recipes.	4
28.3	Preparation of toothpaste or mouthwashes using Unani ingredients	4
28.4	Formulation of Kohl (Surma), and natural blushes	4
29.1	Documentation Review for In-House Quality Control Lab under GMP Guidelines	8
29.2	Essential requirements to establish the GMP-certified Unani drugs industry Field Visit	8
30.1	Analysis of Drug and Magic Remedies (OA) Act, 1954 Cases	8
30.2	Review of Excise Duties Act, 1955	7
30.3	Review of Narcotic Drugs and Psychotropic Substances Act, 1985	5

31.1	Awareness about Intellectual Property Rights (IPR) of Unani medicine	10
31.2	Patent application for a Unani drug	10
32.1	Documenting and reporting adverse drug reactions (ADR).	10
32.2	Data Analysis by using Artificial Intelligence Tools (e.g., predictive modeling software)	10
33.1	Handling raw materials and finished products	10
33.2	Quality Management System (QMS) plan for a Unani drug manufacturing unit	10
34.1	Designing and execution of mock advertising matter for a Unani product, focusing on its unique benefits.	10
34.2	Resources and schemes for startups	10

Table 5 : Experiential learning Activity

(*Refer table 3 of similar activity number)

Experiential learning No*	Experiential name	Hours
1.1	Size Reduction of Unani drugs	8
1.2	Size Separation of Unani drugs	6
1.3	Mixing & Homogenization of different forms of Unani Medicines	6
1.4	Drying of Unani Medicines	6
2.1	Clarification & Filtration of Unani drugs	8
2.2	Extraction of Unani drugs	8
2.3	Sterilization	5
2.4	Heating Processes	5
3.1	Dosage form designing	5
3.2	Disperse systems	9

3.3	Rheology	5
3.4	Bioavailability	3
3.5	Pharmaceutical pre-formulation	4
4.1	Novel drug delivery systems (NDDS)	2
4.2	Transdermal drug delivery system	6
4.3	Ocular & Nasal drug delivery systems	6
4.4	Pulmonary drug delivery system	6
4.5	Colon, Rectal & Vaginal drug delivery systems	6
5.1	Solid dosage forms	9
5.2	Liquid dosage forms	8
5.3	Semi solid dosage forms	6
5.4	Pharmaceutical aerosols	6
5.5	Modified-release dosage forms	6
5.6	Paediatric & Geriatric dosage forms	4
6.1	Bases and Vehicles	3
6.2	Permitted Colorants & Flavoring Agents	3
6.3	Permitted Preservatives	2
6.4	Alternate Sweeteners	3
6.5	Surfactants and Emulsifying Agents	2
7.1	Application of Nanotechnology in Unani Pharmaceutical Sciences	6
7.2	Bioinformatics in Unani Pharmaceutical Sciences	6
7.3	Computers in Unani Pharmaceutics	7
7.4	Artificial Intelligence (AI) in Unani Pharmaceutics	7

8.1	Types of Packaging	4
8.2	Packaging in Unani Pharmaceutics	6
8.3	Advancements in packaging	6
8.4	Pharmaceutical Manufacturing Facilitie	10
9.1	Factors that affect the quality of Unani drugs	4
9.2	Ethical substitution of drugs as per classical Unani literature	4
9.3	Botanical Reference Standards (BRS) of Unani drugs	6
9.4	Parameters of drug standardisation and quality control	6
9.5	Monograph of a Unani Drug	6
10.1	Eextract the sample of a drug using different solvents	4
10.2	Extracts of Unani drugs using different methods of extraction	8
10.3	Fixed and volatile oil of a given sample	8
10.4	Non-volatile Ether soluble extractive value, Volatile Ether soluble extractive value, Solvent Hexane soluble extractive value, Alcohol-soluble extractive value, and Water soluble extractive value	6
11.1	Stomatal Number, Stomatal Index, Vein-Islet and Veinlet termination number and palisade ratio of the leaf.	6
11.2	Ash values of the given sample	6
11.3	Two different methods of determination of moisture content	6
11.4	Melting point and melting range of Unani drugs	4
11.5	Specific gravity, density and solubility of a Unani Drug.	4
12.1	Analysis of viscosity of different Unani formulations	8
12.2	Preliminary phytochemical screening of a Unani drugs.	10
12.3	Constants of fats in oil-containing drugs	8
13.1	Apparatus and instruments of chromatography	1

13.2	Paper chromatography technique	2
13.3	Thin-layer chromatography	8
13.4	High-Performance Thin Layer Chromatography technique	4
13.5	Column Chromatography and its Advancement	2
13.6	High-Performance Liquid chromatography	3
13.7	Gas chromatography	6
14.1	colorimetery analysis	5
14.2	UV- Visible spectroscopy	7
14.3	Flame emission spectroscopy technique	7
14.4	Atomic absorption spectroscopy	7
15.1	Microbial Contamination Limits	3
15.2	Aflatoxins in Unani Drugs	3
15.3	Pesticide residue in Unani drugs	3
15.4	Heavy metals in Unani drugs	4
16.1	Analytical specifications of Unani formulations viz. Arq, Sirka, Roghan, Joshanda, Sharbat, Itrifal, Majoon, Khamira, Marham/Zimad/Qairooti, Habb/Qurs, Safoof, Kushta	6
16.2	Evaluate the Flow Properties of powders and granules	3
16.3	Quality of tablet/pill using various parameters viz. Hardness, Weight Variation, Friability and Disintegration.	4
17.1	Shelf-life of compound drugs mentioned in Unani literature and D & C Act	4
17.2	Protocol for Stability testing	4
17.3	Design a stability study in view of ICH guidelines for stability testing	5
18.1	In-house Quality control section as per Schedule-T	4
18.2	Analytical lab as per PART XVI (A) of Drugs Rules, 1945	4

18.3	Sample of Kushta	5
19.1	Virtual Animal Research Ethics and Application Simulation	10
19.2	Experimental Design and Ethical Case Studies in Animal Research	10
19.3	Moot Institutional Animal Ethics Committee (IAEC) Meeting & Protocol Review	6
20.1	Unani pharmacognosy through time	7
20.2	Farm to Pharmacy: The quality control of Unani Drug	7
20.3	Visit to the herbal garden	6
20.4	Field-Based Exploration of Medicinally Important Plant Families.	6
21.1	Preclinical Strategy Design for Unani Formulation	7
21.2	Rodent Model Characterization: Behavior, Biology, and Experimental Suitability	7
21.3	Non-Rodent Experimental Models: importance, Anatomy and Physiological Relevance.	6
21.4	Ethically conscious preclinical screening of Invertebrate models in pharmacology.	6
22.1	Morphological and Anatomical Insights for Plant Identification	7
22.2	Plant Tissue Differentiation and Ergastic Contents Through Visual and Comparative Study	7
22.3	Identification of Powdered Drug through Preliminary Tests and Microscopical Examination	6
22.4	Application of Chromatographic and Spectrophotometric Techniques in Identification and Standardization of Crude Drugs.	6
23.1	Simulated Pre-clinical Study: From Protocol to Waste Disposal.	7
23.2	Designing Ethical Research: A Multi-Modal Alternative Approach.	7
23.3	Functioning of Wire Myographs and Force Transducers .	6
23.4	Isolated Tissue/Muscle Preparation: Ethical consideration and Pharmacological importance.	6
24.1	Fundamentals and Practice of Bioassay.	9
24.2	Behavioural Pharmacology Apparatus: Actophotometer, /Pole Climbing apparatus/ Mazes	9

24.3	Comprehensive Toxicity Assessment and ethical consideration.	8
25.1	Screening of analgesic, antipyretic and anti-inflammatory activities using simulation methods Preparation of experimental design on analgesic, antipyretic and anti-inflammatory activities using animal models	7
25.2	Students engage in observation, simulation, or participation in tests like Irwin's Profile, FST, EPM, and MES to experience real-time animal behavior analysis, drug response evaluation, and data interpretation in a controlled, ethical setting	7
25.3	Screening of hepatoprotective, and nephroprotective studies using simulation methods Preparation of experimental design on hepatoprotective, and nephroprotective studies using animal models.	7
25.4	Screening of anti-diabetic and hypolipidemic studies using simulation methods. Preparation of experimental design on anti-diabetic and hypolipidemic studies using animal models.	5
26.1	Theoretical understanding of Alkaloids and Glycosides.	7
26.2	Understanding the Classification, Sources, and Therapeutic Applications of Lipids and Volatile Oils.	7
26.3	Understanding the Characteristics, Classification, and Therapeutic Uses of Gums and Resins.	7
26.4	Classification, Properties, and Therapeutic Significance of Tannins and Saponins.	5
27.1	Herbal Ingredient Sourcing / Procurement	6
27.2	Field Visit to a Cosmetic Industry/Preparation of a cosmetic in an In-house lab.	6
27.3	Itriyat (Scent) Identification Workshop	6
27.4	Development of a new cosmetic product	8
28.1	Product Testing & Feedback	10
28.2	Hair care Product analysis	5
28.3	Market Survey on Oral Care Products	6
28.4	Kuhl Preparation Workshop	5
29.1	Presenation / Poster presentation Pharmacy Visit	10
29.2	Presentation / Poster Presentation Pharmacy Visit	10

29.3	Visit to GMP Compliance Unit.	10
30.1	Compliance Audit of Manufacturing Process	9
30.2	Raw Material Sourcing and the Biological Diversity Act	8
30.3	Workshop on regulatory Audit in Unani Pharmacy	9
31.1	Educational material about Intellectual Property Rights (IPR) in Unani medicine	7
31.2	Case Study on Trademark (TM) Filing and Global Market Accessibility	6
31.3	Workshop on Patent Search and Analysis	7
31.4	Workshop on Ethical Considerations in Patenting Traditional Knowledge	6
32.1	ADR Case Study Analysis	6
32.2	Workshop on Pharmacovigilance Challenges	7
32.3	AI Application in Drug Discovery	7
32.4	Online Seminar on role of AI in Unani Medicine	6
33.1	Field Visit to a Unani Drug Storage Facility	7
33.2	Simulation Exercise on Material Flow	7
33.3	QMS Workshop	6
33.4	Interactive Workshop on Quality Management	6
34.1	Regulatory requirements for Unani medicines in various countries	4
34.2	Workshop on Marketing Opportunities for Unani Drugs/International Regulatory Opportunities for Unani Drug Registration	5
34.3	Brand Development Exercise	8
34.4	Business Plan Development	9

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
UNIPG-IS	4	100 x 4 Papers = 400	400	800

6 B : Scheme of Assessment (Formative and Summative Assessment)

Credit frame work

UNIPG-IS consists of 34 modules totaling 64 credits, which correspond to 1920 Notional Learning Hours. Each credit comprises 30 Hours of learner engagement, distributed across teaching, practical, and experiential learning in the ratio of 1:2:3. Accordingly, one credit includes 5 hours of teaching, 10 hours of practical training, 13 hours of experiential learning, and 2 hours allocated for modular assessment, which carries 25 marks.

Formative Assessment : Module wise Assessment:will be done at the end of each module. Evaluation includes learners active participation to get Credits and Marks. Each Module may contain one or more credits.

Summative Assessment: Summative Assessment (University examination) will be carried out at the end of Semester VI.

6 C : Calculation Method for Modular Grade Points (MGP)

Module Number & Name (a)	Credits (b)	Actual No. of Notional Learning Hours (c)	Attended Number of notional Learning hours (d)	Maximum Marks of assessment of modules (e)	Obtained Marks per module (f)	MGP =d*f/c*e*100
Semester No : 3						
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)						
M 1 Principles and Application of Pharmaceutical Processing - I اعمال صیدلہ کے اصول اور اطلاق	2	60		50		
M 2 Principles and Application of Pharmaceutical Processing - II اصول دواسازی اور ان کا اطلاق	2	60		50		
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)						
M 9 Quality Assurance, Standardisation and Good Practices in Unani Drugs یونانی ادویہ کی ضمانت اوصاف، معیار بندی اور صنعت جیدہ	2	60		50		
M 10 Extraction of Herbal Drugs تعصیر ادویہ	2	60		50		
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)						
M 19 General Considerations in Experimental Pharmacology تجرباتی علم الادویہ کے عمومی نکات	2	60		50		
M 20 General Introduction to Pharmacognosy علم وصف العقاقیر کا عمومی تعارف	2	60		50		
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)						
M 27 Unani Cosmetology یونانی تزئینیات	2	60		50		
M 28 Production of Unani cosmetics یونانی صنعت تزئینیات	2	60		50		
	16	480		400		
Semester No : 4						
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)						

M 3 Formulation of Unani Pharmaceutical Dosage Form یونانی اشکال ادویہ کی ترکیب	2	60		50		
M 4 Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine یونانی دواسازی میں ترسیل ادویہ کے جدید نظام کا انضمام	2	60		50		
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)						
M 11 Physico-chemical Evaluation of Unani Drugs-I یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ	2	60		50		
M 12 Physico-chemical Evaluation of Unani Drugs-II یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ	2	60		50		
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)						
M 21 Laboratory Animals used in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے تجرباتی جانور	2	60		50		
M 22 Identification of crude drugs خام ادویہ کی شناخت	2	60		50		
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)						
M 29 Regulatory Framework for Unani Drugs قوانین وضوابط برائے یونانی ادویہ	2	60		50		
M 30 Other regulatory provisions in relation to Unani Drugs یونانی ادویہ کے حوالے سے دیگر قانونی ضوابط	2	60		50		
	16	480		400		
Semester No : 5						
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)						
M 5 Conventional Pharmaceutical Dosage Forms روایتی اشکال ادویہ	3	90		75		
M 6 Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms یونانی اور جدید اشکال ادویہ میں اساس، حامل مرکبات اور منظور شدہ غیر فعال اجزاء	1	30		25		
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)						
M 13 Chromatographic Techniques کرومیٹوگرافک تکنیکس	2	60		50		
M 14 Spectroscopic Techniques اسپیکٹروسکوپک تکنیکس	2	60		50		

Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)						
M 23 In Vitro Experimental Studies and Alternative to Animal Experimentation ان وٹرو تجرباتی مطالعات اور حیوانات کے متبادل	2	60		50		
M 24 Bioassay and Toxicity studies حیاتی تعین و مطالعہ سمیت	2	60		50		
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)						
M 31 Intellectual Property of Unani Drugs یونانی دوائیں اور حق دانشوری	2	60		50		
M 32 Pharmacovigilance and use of Artificial Intelligence in Unani Pharmacy (فارماکو ویجلنس اور یونانی فارمیسی میں مصنوعی ذہانت کا استعمال)	2	60		50		
	16	480		400		
Semester No : 6						
Paper No : 1 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)						
M 7 Integration of technological advancements in Unani Pharmaceutical Sciences یونانی دواسازی میں تکنیکی پیش رفت کا انضمام	2	60		50		
M 8 Packaging Material & Production Management in Unani Pharmaceutics (یونانی دواسازی میں پیکیجنگ میٹیریل اور تنظیم صنعت)	2	60		50		
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)						
M 15 Determination of contaminants in Unani drugs یونانی ادویہ میں آلودگیوں کا تعین	1	30		25		
M 16 Standardisation of compound drugs ادویہ مرکبہ کی معیار بندی	1	30		25		
M 17 Shelf-life & Stability Studies of Unani Drugs یونانی ادویہ کی مدت حیات اور استحکامی مطالعے	1	30		25		
M 18 Analytical/Quality testing laboratory as per Drugs Rules, 1945 ادویہ قوانین 1945 کے مطابق تجزیہ اوصاف کی تجربہ گاہ	1	30		25		
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)						
M 25 In-Vivo Animal Experimentation studies حیوانات پر کیے جانے والے تجرباتی مطالعات/جاندار نسیج	2	60		50		
M 26 Secondary metabolites of medicinal plants طبی نباتات کے ثانوی استحالاتی مرکبات	2	60		50		

Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)						
M 33 Unani Pharmaceutical Management ،یونانی صنعت دواسازی کی تنظیم	2	60		50		
M 34 Commercialization and Marketing of Unani drugs (یونانی دواوں کی تجارت اور خرید و فروخت	2	60		50		
	16	480		400		
MGP = ((Number of Notional learning hours attended in a module) X (Marks obtained in the modular assessment) / (Total number of Notional learning hours in the module) X (Maximum marks of the module)) X 100						

6 D : Semester Evaluation Methods for Semester Grade Point Average (SGPA)

SGPA will be calculated at the end of the semester as an average of all Module MGPs. Average of MGPS of the Semester For becoming eligible for Summative assessment of the semester, student should get minimum of 60% of SGPA

SGPA = Average of MGP of all modules of all papers = add all MGPs in the semester/ no. of modules in the semester Evaluation Methods for Modular Assessment

Semester No : 3		
Paper No : 1 PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
1	M1.Principles and Application of Pharmaceutical Processing - I اعمال صیدلہ کے اصول اور اطلاق	C 1
2	M2.Principles and Application of Pharmaceutical Processing - II اصول دواسازی اور ان کا اطلاق	C 2
Paper No : 2 STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
3	M9.Quality Assurance, Standardisation and Good Practices in Unani Drugs یونانی ادویہ کی ضمانت اوصاف، معیار بندی اور صنعت جیدہ	C 3

4	M10.Extraction of Herbal Drugs تعصیرادویہ	C 4
Paper No : 3 EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY		
A S.No	B Module number and Name	C MGP
5	M19.General Considerations in Experimental Pharmacology تجرباتی علم الادویہ کے عمومی نکات	C 5
6	M20.General Introduction to Pharmacognosy علم وصف العقاقیر کا عمومی تعارف	C 6
Paper No : 4 UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT		
A S.No	B Module number and Name	C MGP
7	M27. Unani Cosmetology یونانی تزئینیات	C 7
8	M28.Production of Unani cosmetics یونانی صنعت تزئینیات	C 8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 4		
Paper No : 1 PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA		
A S.No	B Module number and Name	C MGP
1	M3.Formulation of Unani Pharmaceutical Dosage Form یونانی اشکال ادویہ کی ترکیب	C 1
2	M4.Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine یونانی دواسازی میں ترسیل ادویہ کے جدید نظام کا انضمام	C 2
Paper No : 2 STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS		
A S.No	B Module number and Name	C MGP

3	M11.Physico-chemical Evaluation of Unani Drugs-I یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ	C 3
4	M12.Physico-chemical Evaluation of Unani Drugs-II یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ	C 4
Paper No : 3 EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
5	M21.Laboratory Animals used in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے تجرباتی جانور	C 5
6	M22.Identification of crude drugs خام ادویہ کی شناخت	C 6
Paper No : 4 UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
7	M29.Regulatory Framework for Unani Drugs قوانین وضوابط برائے یونانی ادویہ	C 7
8	M30.Other regulatory provisions in relation to Unani Drugs یونانی ادویہ کے حوالے سے دیگر قانونی ضوابط	C 8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 5		
Paper No : 1 PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
1	M5.Conventional Pharmaceutical Dosage Forms روایتی اشکال ادویہ	C 1

2	M6.Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms یونانی اور جدید اشکال ادویہ میں اساس، حامل مرکبات اور منظور شدہ غیر فعال اجزاء	C 2
Paper No : 2 STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS		
A S.No	B Module number and Name	C MGP
3	M13.Chromatographic Techniques کرومیٹوگرافک تکنیکس	C 3
4	M14.Spectroscopic Techniques اسپیکٹروسکوپک تکنیکس	C 4
Paper No : 3 EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY		
A S.No	B Module number and Name	C MGP
5	M23.In Vitro Experimental Studies and Alternative to Animal Experimentation ان وٹرو تجرباتی مطالعات اور حیوانات کے متبادل	C 5
6	M24.Bioassay and Toxicity studies حیاتی تعین و مطالعہ سمیت	C 6
Paper No : 4 UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT		
A S.No	B Module number and Name	C MGP
7	M31.Intellectual Property of Unani Drugs یونانی دوائیں اور حق دانشوری	C 7
8	M32.Pharmacovigilance and use of Artificial Intelligence in Unani Pharmacy (فارماکو ویجلنس اور یونانی فارمیسی میں مصنوعی ذہانت کا استعمال)	C 8
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8) / Number of modules(8)
Semester No : 6		
Paper No : 1 PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA		
A S.No	B Module number and Name	C MGP

1	M7.Integration of technological advancements in Unani Pharmaceutical Sciences یونانی دواسازی میں تکنیکی پیش رفت کاانضمام	C 1
2	M8.Packaging Material & Production Management in Unani Pharmaceutics (یونانی دواسازی میں پیکیجنگ میٹیریل اور تنظیم صنعت)	C 2
Paper No : 2 STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
3	M15.Determination of contaminants in Unani drugs یونانی ادویہ میں آلودگیوں کا تعین	C 3
4	M16.Standardisation of compound drugs ادویہ مرکبہ کی معیار بندی	C 4
5	M17.Shelf-life & Stability Studies of Unani Drugs یونانی ادویہ کی مدت حیات اور استحکامی مطالعے	C 5
6	M18.Analytical/Quality testing laboratory as per Drugs Rules, 1945 ادویہ قوانین 1945 کے مطابق تجزیہ اوصاف کی تجربہ گاہ	C 6
Paper No : 3 EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
7	M25.In-Vivo Animal Experimentation studies حیوانات پر کیے جانے والے تجرباتی مطالعات/جاندار نسیج	C 7
8	M26.Secondary metabolites of medicinal plants طبی نباتات کے ثانوی استحالاتی مرکبات	C 8
Paper No : 4 UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT		
A **S.No**	**B** **Module number and Name**	**C** **MGP**
9	M33. Unani Pharmaceutical Management یونانی صنعت دواسازی کی، تنظیم	C 9

10	M34.Commercialization and Marketing of Unani drugs یونانی ادویات کی تجارت اور خرید و فروخت)	C 10
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5+C6+C7+C8+C9+C10) / Number of modules(10)

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 Unani Examination

UNIPG-IS

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 (PHARMACEUTICAL ADVANCEMENTS AND APPLICATION IN ILMUL SAIDLA)				
(M-1) Principles and Application of Pharmaceutical Processing - I اعمال صیدلہ کے اصول اور اطلاق (Marks: Range 5-20)				
1	**(U-1)** Size Reduction of Unani drugs یونانی ادویہ کی تقصیر اجزاء	Yes	Yes	Yes
2	**(U-2)** Size Separation of Unani drugs حجم کے لحاظ سے یونانی ادویہ کے اجزاء کی تفریق	Yes	Yes	Yes
3	**(U-3)** Mixing & Homogenization of different dosage forms of Unani Medicines مختلف یونانی اشکال ادویہ کی باہم آمیزش اور یکسانیت	Yes	Yes	Yes
4	**(U-4)** Drying of Unani Medicines یونانی ادویہ کی تجفیف	Yes	Yes	Yes
(M-2) Principles and Application of Pharmaceutical Processing - II اصول دواسازی اور ان کا اطلاق (Marks: Range 5-20)				
1	**(U-1)** Clarification & Filtration of Unani drugs یونانی ادویہ پر عمل ترویق و تصفیہ	Yes	Yes	Yes
2	**(U-2)** Extraction of Unani drugs یونانی ادویہ پر عمل تعصیر	Yes	Yes	Yes
3	**(U-3)** Sterilization تطہیر	Yes	Yes	Yes
4	**(U-4)** Heating Processes حرارت کاری	Yes	Yes	Yes
(M-3) Formulation of Unani Pharmaceutical Dosage Form یونانی اشکال ادویہ کی ترکیب (Marks: Range 5-15)				
1	**(U-1)** Introduction to formulation of dosage form اشکال ادویہ کی ترکیب کا تعارف	No	Yes	No
2	**(U-2)** Disperse systems نظام امتداد	No	Yes	Yes
3	**(U-3)** Rheology مطالعہ سیالیات و لزوجیت	No	Yes	No
4	**(U-4)** Bioavailability حیاتی اثر پذیری	No	Yes	Yes
5	**(U-5)** Pharmaceutical preformulation دواسازی کے اعمال ماقبل ترکیب	No	Yes	Yes
(M-4) Integration of Novel Drug Delivery Systems (NDDS) in Unani Medicine یونانی دواسازی میں ترسیلِ ادویہ کے جدید نظام کا انضمام (Marks: Range 5-20)				
1	**(U-1)** Introduction to NDDS جدید نظامِ ترسیلِ ادویہ کا تعارف	No	Yes	Yes
2	**(U-2)** Transdermal drug delivery system (TDDS) نظام ترسیل ادویہ براہ جلد	Yes	Yes	Yes

3	**(U-3)** Ocular & Nasal Drug Delivery Systems نظام ترسیل ادویہ برائے عین وانف	No	Yes	No
4	**(U-4)** Pulmonary drug delivery system نظام ترسیل ادویہ ریوی	No	Yes	No
5	**(U-5)** Colon, rectal & vaginal drug delivery systems نظام ترسیل ادویہ برائے قولون، مقعد و مہبل	No	Yes	No
(M-5) Conventional Pharmaceutical Dosage Forms روایتی اشکال ادویہ (Marks: Range 5-20)				
1	**(U-1)** Solid dosage forms جامد اشکال ادویہ	Yes	Yes	Yes
2	**(U-2)** Liquid dosage forms سیال اشکال ادویہ	Yes	Yes	Yes
3	**(U-3)** Semi solid dosage forms نیم جامد اشکال ادویہ	Yes	Yes	Yes
4	**(U-4)** Pharmaceutical aerosols بخاری اشکال ادویہ	No	Yes	Yes
5	**(U-5)** Modified-release dosage forms ترمیم شدہ اخراج کی حامل اشکال ادویہ	No	Yes	No
6	**(U-6)** Paediatric & Geriatric dosage forms اشکال ادویہ برائے اطفال و مشائخ	No	Yes	No
(M-6) Bases, Vehicles and Permitted Pharmaceutical Excipients in Unani & Conventional dosage forms یونانی اور جدید اشکال ادویہ میں اساس، حامل مرکبات اور منظور شدہ غیر فعال اجزاء (Marks: Range 5-20)				
1	**(U-1)** Bases and Vehicles اساس اور حامل مرکبات	Yes	Yes	Yes
2	**(U-2)** Permitted Colorants & Flavoring Agents منظور شدہ اجزاء لونیہ اور اجزاء عطریہ	No	Yes	No
3	**(U-3)** Permitted Preservatives منظور شدہ محافظ ادویہ	No	Yes	Yes
4	**(U-4)** Alternate Sweeteners متبادل اجزاء حلویہ	No	Yes	No
5	**(U-5)** Surfactants and Emulsifying Agents عامل فعال سطحی عامل حلیب	Yes	Yes	Yes
(M-7) Integration of technological advancements in Unani Pharmaceutical Sciences یونانی دواسازی میں تکنیکی پیش رفت کا انضمام (Marks: Range 5-15)				
1	**(U-1)** Technological advancements in Unani Pharmaceutical Sciences علم الصیدلہ میں تکنیکی پیش رفت	No	Yes	Yes
2	**(U-2)** Nanotechnology in Unani Pharmaceutical Sciences علم الصیدلہ اور نینو ٹکنولوجی	No	Yes	No

3	**(U-3)** Bioinformatics in Unani Pharmaceutical Sciences علم الصیدلہ اور بائیو انفارمیٹکس	No	Yes	No
4	**(U-4)** Application of Computers in Unani Pharmaceutics یونانی دواسازی میں کمپیوٹرز کا اطلاق	No	Yes	No
5	**(U-5)** Role of Artificial Intelligence (AI) in Unani Pharmaceutics علم الصیدلہ میں مصنوعی ذہانت کا کردار	No	Yes	Yes
(M-8) Packaging Material & Production Management in Unani Pharmaceutics (یونانی دواسازی میں پیکیجنگ میٹیریل اور تنظیم صنعت) (Marks: Range 5-20)				
1	**(U-1)** Packaging Material پیکیجنگ میٹیریل	No	Yes	No
2	**(U-2)** Types of Packaging پیکیجنگ کی اقسام	Yes	Yes	Yes
3	**(U-3)** Packaging materials used in pharmaceutics دواسازی میں مستعمل پیکیجنگ میٹیریل	Yes	Yes	Yes
4	**(U-4)** Pharmaceutical advancements in packaging دواؤں کی پیکیجنگ میں ہونے والی پیش رفت	No	Yes	Yes
5	**(U-5)** Production management تنظیم دواسازی	Yes	Yes	Yes
S.No	**List of Module/Unit**	**ABQ**	**SAQ**	**LAQ**
Paper No : 2 (STANDARDISATION AND QUALITY CONTROL OF UNANI DRUGS)				
(M-9) Quality Assurance, Standardisation and Good Practices in Unani Drugs (یونانی ادویہ کی ضمانت اوصاف، معیار بندی اور صنعت جیدہ Marks: Range 5-20)				
1	**(U-1)** Quality Assurance, Quality Control and Standardisation ضمانت اوصاف، ضبط اوصاف اور معیار بندی	No	Yes	Yes
2	**(U-2)** Adulteration in Unani drugs یونانی ادویہ میں آمیزش	Yes	Yes	Yes
3	**(U-3)** Pre-requisites and primary steps for the quality, safety and efficacy of herbal medicines ادویہ کے معیاری، محفوظ اور مؤثر ہونے کے لئے درکار اقتضاء اساسی اور ابتدائی اقدامات	Yes	Yes	Yes
4	**(U-4)** Aims and objectives of standardisation of Unani drugs یونانی ادویہ کی معیار بندی کے مقاصد اور اہداف	No	Yes	Yes

5	**(U-5)** Overview of Pharmacopeial Monographs فارماکوپیئل مونوگراف کاجائزہ	No	Yes	No
(M-10) Extraction of Herbal Drugs تعصیرادویہ (Marks: Range 5-20)				
1	**(U-1)** Introduction and importance of extraction in drug analysis ادویہ کے تجزیہ میں عمل تعصیر کاتعارف اور اہمیت	No	Yes	Yes
2	**(U-2)** Solvents used for extracting drugs and their properties عمل تعصیر میں مستعمل محللات اور ان کی خصوصیات	Yes	Yes	Yes
3	**(U-3)** Methods of extraction عمل تعصیر کے طریقے	Yes	Yes	Yes
4	**(U-4)** Extraction of volatile and fixed oils روغن فراری اور روغن کثیف کشید کرنے کے طریقے	Yes	Yes	Yes
5	**(U-5)** Determination of extractives in specific solvents مخصوص محللات میں مقدار تعصیر کاتعین	Yes	Yes	Yes
6	**(U-6)** Advanced extraction techniques عمل تعصیر کے جدید طریقے	No	Yes	Yes
(M-11) Physico-chemical Evaluation of Unani Drugs-I یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ (Marks: Range 5-20)				
1	**(U-1)** Introduction of apparatus, Morphological Examination & Microscopical evaluation of Unani Drugs آلات کاتعارف، یونانی ادویہ کا نظری معائنہ اور خوردبینی تجزیہ	Yes	Yes	No
2	**(U-2)** Ash Value ایش ویلو	Yes	Yes	Yes
3	**(U-3)** Moisture Content نمی کی مقدار	Yes	Yes	Yes
4	**(U-4)** Melting Point & pH نقطہ اذابت اور پی ایچ	No	Yes	No
5	**(U-5)** Specific Gravity, Density & Solubility مخصوص ثقل اضافی، کثافت اور حل پذیری	Yes	Yes	No
(M-12) Physico-chemical Evaluation of Unani Drugs-II یونانی ادویہ کا طبعی اور کیمیاوی تجزیہ (Marks: Range 5-20)				
1	**(U-1)** Viscosity لزوجت قوام	Yes	Yes	Yes
2	**(U-2)** Refractive Index & Optical Rotation انعطافی اشاریہ اور نوری گردش	Yes	Yes	No
3	**(U-3)** Limit Tests as per UPI and Chemical tests for Phytoconstituents یو پی آئی کے مطابق حدود تفتیش اور نباتی اجزاء کے لیے کیمیاوی تفتیش	No	Yes	No
4	**(U-4)** Determination of Constants of Fats and Oils شحوم و روغنیات کے معیار کا تعین	Yes	Yes	No

(M-13) Chromatographic Techniques کرومیٹوگرافک تکنیکس (Marks: Range 5-20)				
1	**(U-1)** Introduction of Chromatography, Types, Principle, apparatus, instrumentation کرومیٹوگرافی کا تعارف،اقسام،اصول،آلات	No	Yes	Yes
2	**(U-2)** Paper chromatography پیپر کرومیٹوگرافی	No	Yes	Yes
3	**(U-3)** Thin Layer chromatography تھن لیئر کرومیٹوگرافی	Yes	Yes	Yes
4	**(U-4)** High Performance Thin Layer Chromatography ہائی پرفارمنس تھن لیئر کرومیٹوگرافی	Yes	Yes	Yes
5	**(U-5)** Column chromatography کالم کرومیٹوگرافی	Yes	Yes	Yes
6	**(U-6)** High-Performance Liquid chromatography ہائی پرفارمنس لیکویڈ کرومیٹوگرافی	Yes	Yes	Yes
7	**(U-7)** Gas chromatography گیس کرومیٹوگرافی	Yes	Yes	Yes
8	**(U-8)** Ion exchange chromatography آین ایکسچینج کرومیٹوگرافی	No	Yes	No
9	**(U-9)** Advanced Chromatographic Techniques جدید کرومیٹوگرافک تکنیکس	No	Yes	No
(M-14) Spectroscopic Techniques اسپیکٹروسکوپک تکنیکس (Marks: Range 5-20)				
1	**(U-1)** Introduction of spectroscopy اسپیکٹروسکوپی کا تعارف	No	Yes	Yes
2	**(U-2)** UV-Visible spectroscopy یو۔وی۔وزبل اسپیکٹروسکوپی	Yes	Yes	Yes
3	**(U-3)** Vibrational Spectroscopy وائبریشنل اسپیکٹروسکوپی	Yes	Yes	Yes
4	**(U-4)** Flame emission spectroscopy فلیم ایمیشن اسپیکٹروسکوپی	Yes	Yes	Yes
5	**(U-5)** Atomic absorption spectroscopy اٹامک ابزارپشن اسپیکٹروسکوپی	Yes	Yes	Yes
6	**(U-6)** NuclearMagnetic Resonance Spectroscopy نیوکلیئر میگنیٹک ریزونس اسپیکٹروسکوپی	No	Yes	Yes
7	**(U-7)** Mass Spectroscopy ماس اسپیکٹروسکوپی	No	Yes	Yes
8	**(U-8)** FTIR, ICP-OES & ICP-MS ایف ٹی آئی آر،آئی سی پی۔اوای ایس اور آئی سی پی۔ایم ایس	Yes	Yes	No
(M-15) Determination of contaminants in Unani drugs یونانی ادویہ میں آلودگیوں کا تعین (Marks: Range 5-20)				
1	**(U-1)** Microbial Contamination جرثومی آلودگیاں	Yes	Yes	Yes

2	**(U-2)** Aflatoxins افلاٹوکسن	Yes	Yes	Yes
3	**(U-3)** Pesticide residue کرم کُش باقیات	Yes	Yes	Yes
4	**(U-4)** Heavy Metals ثقیل دھاتیں	Yes	Yes	Yes
5	**(U-5)** Radioactive contamination ریڈیواکٹیو آلودگی	No	Yes	No
(M-16) Standardisation of compound drugs ادویہ مرکبہ کی معیار بندی (Marks: Range 5-20)				
1	**(U-1)** Overview of Monographs of Unani Compound Drugs mentioned in UPI Part -II یو پی آئی حصہ دوم میں درج یونانی مرکب ادویہ کے مونو گراف کا جائزہ	Yes	No	Yes
2	**(U-2)** Specific Parameters of Solid Dosage Form Powder and Granules جامد اشکال ادویہ، سفوف اور دانہ دار سفوف کے مخصوص معیارات	Yes	Yes	Yes
3	**(U-3)** Tablets and Pills قرص وحب	Yes	Yes	Yes
(M-17) Shelf-life & Stability Studies of Unani Drugs یونانی ادویہ کی مدت حیات اور استحکامی مطالعے (Marks: Range 5-20)				
1	**(U-1)** Shelf-life & Stability Studies مدت حیات اور استحکامی مطالعے	Yes	Yes	Yes
2	**(U-2)** Stability Studies استحکامی مطالعے	Yes	Yes	Yes
3	**(U-3)** International Council for Harmonisation (ICH) انٹرنیشنل کاؤنسل فار ہارمونائیزیشن	Yes	Yes	Yes
(M-18) Analytical/Quality testing laboratory as per Drugs Rules, 1945 ادویہ قوانین 1945 کے مطابق تجزیہ اوصاف کی تجربہ گاہ (Marks: Range 5-20)				
1	**(U-1)** Analytical/Quality testing laboratory تجزیہ اوصاف کی تجربہ گاہ	Yes	Yes	Yes
2	**(U-2)** PART XVI (A) of Drugs Rules, 1945 ادویہ قوانین 1945 کا حصہ XVI (A)	Yes	No	Yes
3	**(U-3)** Quality Control of Kushtajat کشتہ جات کا ضبط اوصاف	Yes	Yes	Yes
S.No	**List of Module/Unit**	**ABQ**	**SAQ**	**LAQ**
Paper No : 3 (EXPERIMENTAL PHARMACOLOGY AND APPLIED PHARMACOGNOSY)				
(M-19) General Considerations in Experimental Pharmacology تجرباتی علم الادویہ کے عمومی نکات (Marks: Range 5-20)				
1	**(U-1)** Basics of Experimental Pharmacology تجرباتی علم الادویہ کا اساسی علم	Yes	Yes	Yes

2	**(U-2)** Dosing and Sampling of experimental animals تجرباتی حیوانات کو خوراک دینا اور نمونے جمع کرنا	Yes	Yes	Yes
3	**(U-3)** Ethical considerations for experimental animals تجرباتی حیوانات کے لیے اخلاقی پہلو	No	Yes	Yes
(M-20) General Introduction to Pharmacognosy علم وصف العقاقیر کا عمومی تعارف (Marks: Range 5-20)				
1	**(U-1)** Basics of Pharmacognosy علم وصف العقاقیر کا اساسی علم	No	Yes	Yes
2	**(U-2)** Applied Pharmacognosy عملی علم صف العقاقیر	Yes	Yes	Yes
3	**(U-3)** Plant kingdom and nomenclature نباتات کی اقسام اور اسم بندی	Yes	Yes	Yes
4	**(U-4)** Taxonomical features of medicinally important families طبی نباتی خاندانوں کی درجہ بندی کی خصوصیات	No	Yes	Yes
(M-21) Laboratory Animals used in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے تجرباتی جانور (Marks: Range 5-20)				
1	**(U-1)** Laboratory Animal Experimentation تجرباتی حیوانات پر مطالعے	Yes	Yes	Yes
2	**(U-2)** Rodent Models: Mice, Rats and Guinea pig, Hamster روڈینٹ ماڈلز: چوہے، مائس، گنی پگ، ہیمسٹر	Yes	Yes	Yes
3	**(U-3)** Non-Rodent Models: Rabbits, Monkey, Dog, Cat نان-روڈینٹ ماڈلز: خرگوش، بندر، کتا، بلی	Yes	Yes	Yes
4	**(U-4)** Miscellaneous Models: Frog, Pigeon, Zebra fish, Chicken دیگر ماڈلز: مینڈک، کبوتر، زیبرا فش، مرغی	Yes	Yes	Yes
(M-22) Identification of crude drugs خام ادویہ کی شناخت (Marks: Range 5-20)				
1	**(U-1)** Morphology and Anatomy of plants پودوں کی ساخت اور جسمانی بناوٹ	Yes	Yes	Yes
2	**(U-2)** Cell differentiation and ergastic cell content خلیوں کی تمیز اور ایر گاسٹک خلیاتی مواد	Yes	Yes	Yes
3	**(U-3)** Microscopical techniques for Identification of crude drugs خوردبینی تکنیکیں برائے شناختِ خام ادویہ	Yes	Yes	Yes
4	**(U-4)** Physico-chemical investigations for identification of crude drugs خام ادویہ کی شناخت کے لیے طبعی و کیمیائی تجزیہ	Yes	No	Yes

(M-23) In Vitro Experimental Studies and Alternative to Animal Experimentation ان وٹرو تجرباتی مطالعات اور حیوانات کے متبادل (Marks: Range 5-20)				
1	**(U-1)** Good Laboratory Practice (GLP) for Animal Experimentation (GLP) حیوانات پر تجربات کے لیے اعلیٰ تجرباتی مشق	No	Yes	Yes
2	**(U-2)** Alternative to Animal Experimentation حیوانی تجربات کا متبادل	No	Yes	Yes
3	**(U-3)** Muscle Preparation عضلات کاری	No	Yes	Yes
4	**(U-4)** Apparatus used for studying isolated tissue/ muscles تیار شدہ عضلات و انسجہ کے مطالعہ کے لیے استعمال ہونے والے آلات	No	Yes	Yes
5	**(U-5)** Isolation of tissue/muscle عضلات و انسجہ کی تیاری	Yes	Yes	Yes
(M-24) Bioassay and Toxicity studies حیاتی تعین و مطالعہ سمیت (Marks: Range 5-20)				
1	**(U-1)** Bioassay حیاتی تعین	Yes	Yes	Yes
2	**(U-2)** Commonly used Instruments in Experimental Pharmacology تجرباتی علم الادویہ میں استعمال ہونے والے عمومی آلات	No	Yes	Yes
3	**(U-3)** Toxicity studies مطالعہ سمیت	No	Yes	Yes
(M-25) In-Vivo Animal Experimentation studies حیوانات پر کیے جانے والے تجرباتی مطالعات/جاندار نسیج (Marks: Range 5)				
1	**(U-1)** Antiinflammatory, Analgesic and Antipyretic Animal Experimentation studies دافع التہاب، دافع درد و دافع حمیٰ کے تجرباتی مطالعے	Yes	Yes	Yes
2	**(U-2)** Neurological Studies مطالعہ نظام عصبی	Yes	Yes	Yes
3	**(U-3)** Nephrotoxicity and Hepatoprotective studies گردوں کی سمیت اور تحفظ کبد سے متعلق مطالعے	Yes	Yes	Yes
4	**(U-4)** Antidiabetic and Hypolipidemic Studies دافع ذیابیطس اور تقصیر تدسم سے متعلق مطالعے	Yes	Yes	Yes
(M-26) Secondary metabolites of medicinal plants طبی نباتات کے ثانوی استحالاتی مرکبات (Marks: Range 5-15)				
1	**(U-1)** Alkaloids and Glycosides الکلائڈس اور گلائیکوسائیڈز	No	Yes	Yes
2	**(U-2)** Lipids and Volatile oils شحمیات اور روغن فراری	No	Yes	Yes
3	**(U-3)** Gums and Resins صمغیات و راتینج	No	Yes	Yes

4	**(U-4)** Tannins and Saponins ٹینسزاورساپونز	No	Yes	Yes
S.No	**List of Module/Unit**	**ABQ**	**SAQ**	**LAQ**
Paper No : 4 (UNANI COSMECEUTICALS, REGULATORY AFFAIRS AND PHARMACY MANAGEMENT)				
(M-27) Unani Cosmetology یونانی تزئینیات (Marks: Range 5-20)				
1	**(U-1)** Introduction of Unani Cosmeceuticals یونانی تزئینیات کاتعارف	No	Yes	Yes
2	**(U-2)** Excipients used in Unani Cosmetics یونانی تزئینیات میں غیرفعال اجزاء کااستعمال	Yes	Yes	Yes
3	**(U-3)** 'Itriyāt (Perfumery and fragrances) عطریات	No	Yes	Yes
4	**(U-4)** Product Development مصنوعات کے فروغ کے مراحل	Yes	Yes	Yes
(M-28) Production of Unani cosmetics یونانی صنعت تزئینیات (Marks: Range 5-20)				
1	**(U-1)** Formulation of skin care products جلد کی نگہداشت کیلیے مصنوعات کی تیاری	Yes	Yes	Yes
2	**(U-2)** Formulation of hair care products بالوں کی نگہداشت کیلیے مصنوعات کی تیاری	Yes	Yes	Yes
3	**(U-3)** Formulation of oral care products دھن کی نگہداشت کیلیے مصنوعات کی تیاری	Yes	Yes	Yes
4	**(U-4)** Formulations of colour cosmetic products متلون تزئینیاتی مصنوعات کی تیاری	Yes	Yes	Yes
(M-29) Regulatory Framework for Unani Drugs قوانین وضوابط برائے یونانی ادویہ (Marks: Range 5-15)				
1	**(U-1)** The Drug and Cosmetic Act-1940 1940–1940 ڈرگ اینڈ کاسمیٹکس ایکٹ	No	Yes	Yes
2	**(U-2)** The Drug Rules, 1945 - 1945 ڈرگ رولس	No	Yes	Yes
3	**(U-3)** Good Manufacturing Practices(GMP) of Unani Drugs صنعت جیدہ برائے یونانی دواسازی	No	Yes	Yes
(M-30) Other regulatory provisions in relation to Unani Drugs یونانی ادویہ کے حوالے سے دیگر قانونی ضوابط (Marks: Range 5-15)				
1	**(U-1)** Introduction of other regulatory provisions in relation to Unani Drugs یونانی فارمیسی کے حوالے سے مخصوص قوانین کاتعارف	No	Yes	Yes
(M-31) Intellectual Property of Unani Drugs یونانی دوائیں اور حق دانشوری (Marks: Range 5-20)				
1	**(U-1)** Intellectual Property Rights [IPR] حقوق ملکیت دانشوری،	Yes	Yes	Yes
2	**(U-2)** Patent Laws related to Unani drugs یونانی ادویہ سے متعلق اجازہ تحفظ کے قوانین	No	Yes	Yes

(M-32) Pharmacovigilance and use of Artificial Intelligence in Unani Pharmacy (فارماکوویجلنس اور یونانی فارمیسی میں مصنوعی ذہانت کا استعمال) (Marks: Range 5-20)				
1	**(U-1)** Pharmacovigilance and Safety Monitoring تاثیر ادویہ اور بحفاظت استعمال کی نگہبانی	No	Yes	Yes
2	**(U-2)** Role of Artificial Intelligence in Unani Pharmacy یونانی فارمیسی میں مصنوعی ذہانت کا کردار	Yes	Yes	Yes
(M-33) Unani Pharmaceutical Management، یونانی صنعت دواسازی کی تنظیم (Marks: Range 5-15)				
1	**(U-1)** Material Management مواد کا نظم	No	Yes	Yes
2	**(U-2)** Quality Management نظم اوصاف	No	Yes	Yes
(M-34) Commercialization and Marketing of Unani drugs (یونانی دواوں کی تجارت اور خرید و فروخت) (Marks: Range 5-20)				
1	**(U-1)** Pharmaceutical Marketing of Unani drugs یونانی ادویہ کی مارکیٹنگ	No	Yes	Yes
2	**(U-2)** Advertisement and commercialization اشتہار اور فروغ کے دیگر ذرائع	Yes	Yes	Yes
3	**(U-3)** Pharmaceutical Entrepreneurship and Startups in Unani Medicine یونانی طب میں صنعت کار دواسازی و آغاز گری	Yes	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	Long Practical - One Practical	100
2	Short procedure/Minor practical - Two minor practicals or short procedures	50
3	Spotters - Ten Spotters	50
4	Assessing teaching ability	25
5	Assessing presentation skills	25
6	Viva (4 examiners: 25 marks/each examiner)#	100
7	Logbook (Activity record)	25
8	Practical/Clinical Record: There should be a minimum of one practical from each module.	25
Total Marks		**400**

No separate marks for dissertation viva.

Reference Books/ Resources

S.No	References
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3	Anonymous. National Formulary of Unani Medicine, Part-I to VI, New Delhi: Department of AYUSH, Ministry of Health and Family Welfare, Govt. of India. Part-I 2006. Part-II 2007. Part-III 2001. Part-IV 2006. Part-V 2008. Part-VI 2011.
4	Anonymous. Unani Pharmacopeia of India. Part-I(Vol.I-VI), Part-II(Vol.I-II). New Delhi: Department of AYUSH, Ministry of Health and Family Welfare, Govt. of India. Part-I Vol.I 2007, II 2007, III 2007, IV 2007, V 2008, VI 2009. Part-II Vol.I 2009, II 2010.
5	Afaq, S.H., Tajuddin., Siddiqui, M.M.H. Standardization of Herbal Drugs, Publication Division, AMU, Aligarh 1994.
6	Aftel M. Essence and alchemy. Rose G. Wilcox; 2011
7	Ahmad S, Siddiqui W, Devi MP, Eda S, Paul PK. Changing Marketing Scenario of Medicinal and Aromatic Plants in India. InBioprospecting of Ethnomedicinal Plant Resources 2025 (pp. 399-417). Apple Academic Press.
8	Al-Achi A, Gupta MR, Stagner WC. Integrated pharmaceutics: applied preformulation, product design, and regulatory science. John Wiley & Sons; 2022.
9	Alam MZ. Herbal medicines. APH Publishing; 2008
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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		