



University of Kerala

Discipline	CHEMISTRY				
Course Code	UK4DSECHE207				
Course Title	MEDICINAL AND PHARMACEUTICAL CHEMISTRY II				
Type of Course	DSE				
Semester	4				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	1. General knowledge on primary and secondary metabolites in natural product 2. UK3DSECHE207(preferable)				
Course Summary	The course covers a broad range of topics related to natural product extraction, herbal cosmetics, natural drug leads giving importance to heterocyclic compounds in Natural products. General methods of preparation and evaluation of herbal cosmetics, particularly skincare products. Extraction of natural products prior to method of isolation and latest technology for purification. Practical knowledge on identification of impurities in drug, its formulation. Interpretation of water quality like hardness and to assess its suitability for use. Qualitative determination of primary and secondary metabolites present in plants.				

Detailed Syllabus:

Module	Unit	Content	Hrs
		MEDICINAL AND PHARMACEUTICAL CHEMISTRY II	75
I	HERBAL TECHNOLOGY IN DRUG PREPARATION		9
	1	Introduction to different extraction methods- Maceration, Percolation, Infusion, Decoction, Sonication, Soxhlet Extraction(principle), Microwave-Assisted Extraction, Ultrasound, Pressurized Liquid Extraction, Enzyme- Assisted Extraction. Super Critical Fluid Extraction, Steam Distillation (principle).	3
	2	Selection of solvents for extraction - water, acetone, alcohol and chloroform, petroleum ether. Purification of solvents for extraction (adding salt like Na ₂ SO ₄ and double distillation-Normal and fractional distillation - Methods for drying of extracts-Freeze drying (lyophilization), hot air	3



	drying, vacuum drying, microwave drying and air drying.	
3	Classification of phytoconstituents based on chemical nature- Carbohydrates (monosaccharides and disaccharides), reducing sugar, amino acid, glycosides, protein, alkaloids, volatile oils, saponins, terpenoids and phenolic compounds.	3
II	HERBAL COSMETICS	9
4	Introduction to biphasic liquids (emulsion and suspension) and its stability- General method of preparation and evaluation of herbal cosmetics and skin care products.	2
5	Herbal products of cosmetic importance - Aloe vera, Neem, Henna.	2
6	Acacia concinna pods, Citrus aurantium peel, Liquorice, Sandal wood.	2
7	Olive oil, Wheat germ oil, Almond oil and Tea tree oil with special emphasis on their source, active principles and cosmetic properties.	3
III	HETEROCYCLIC COMPOUNDS THE NATURAL DRUG LEADS	9
8	Nomenclature of Heterocycles-Basic rules (Saturated 3 to 5 membered oxygen, sulphur and nitrogen heterocycles)-Oxirane, aziridine, thiirane, oxacyclobutane, thiacyclobutane, oxacyclopentane, pyrrolidine, piperidine, morpholine.	3
9	Structure of Unsaturated heterocycles- Furan, Thiophene, Pyrrole, Pyridine. Heterocycles with Fused carbocyclic rings- Indole, Indoline, Isoindoline, Quinoline, and Isoquinoline (examples of drug based on each class).	3
10	Heterocyclic drug from Natural source- Alkaloids and Vitamines. Introduction to alkaloids- Morphine, quinine, Nicotine, Seratonine. Introduction to Vitamines -Thiamine, Nicotinamide (Structure of all compounds, uses and source).	3
IV	SEPARATION TECHNIQUES OF CRUDE DRUG	18
11	Introduction to chromatography -Principle (adsorption and partition), mobile and stationary phases (commonly used stationary phase and its significance), elution, R _f value.	2
12	TLC and HPTLC (principle, procedure and uses), paper chromatography, column chromatography, Gel Permeation Chromatography.	5
13	HPLC & GLC Principle, Instrumentation, various column materials used in these techniques (application in the pharmaceutical industry).	4
14	Zone and capillary Electrophoresis.	2
15	Ion Exchange Methods, the relative advantages and limitations of the techniques.	3
16	Theory of Qualitative analysis of primary and secondary metabolites-alkaloids, carbohydrates, glycosides, saponins, protein, phenolic compounds and oils.	2
V	PRACTICAL I- MEDICINAL AND PHARMACEUTICAL CHEMISTRY	30



1	I)Limit Test -Chloride, Sulphate, Iron, Lead, and Arsenic	10
2	II)Formulation of the following dosage forms as per monograph standards and dispensing with appropriate packaging and labelling. i)Simple syrup- Piperazine Citrate Elixir, Aqueous Iodine solution. ii)Emulsion: Castor oil emulsion, Cod liver oil emulsion, Turpentine Liniment, Liquid paraffin emulsion. iii)Suspension: Calamine lotion, Magnesium hydroxide mixture (antacid).	
3	III)Estimation of Ca and Mg in water. IV)Detection of Primary and Secondary, metabolites; alkaloids, carbohydrates, reducing sugar, amino acid, protein, saponins, protein, phenolic compounds, terpenoids, tannins, flavanoid. V) TLC of Plant Pigment.	15

Reference:

1. Paul M. Dewick, *Medicinal Natural Products: A Biosynthetic Approach*, 3rd Edition, John Wiley & Sons, Ltd, 2009.
2. Gurideep R. Chatwal, *Pharmaceutical Chemistry-Organic Vol II*. Himalaya Publishing House, 2010.
3. Kokate C.K., Purohit A.P., Gokhale S.B. *Pharmacognosy*. Published by Nirali Prakashan. 2010.
4. Ashutosh kar, *Pharmacognosy & Pharmacobiotechnology*, New Age International Publishers, 2017.
5. Dr. R. S. Guad, Dr. S. J. Surana, Dr. G. S. Talele, Mrs. S. G. Talele, Mr. S. B. Gokhale, *Natural Excipients*, Pragati Books Pvt. Ltd., 2006.
6. Kirtikar K.R., Basu B.D, *Indian Medicinal Plants In 3 Parts (Set)*, Gyan Publishing House, 2023.
7. B.M. Mithal & RN Saha, *A handbook of Cosmetics*, Vallabh Prakashan, 2019.
8. Vinod Rangari, *Pharmacognosy & Phytochemistry*, Career Publications, 2017.

Practicals

1. R.M. Mehta, *Pharmaceutics -I,5th Edn*, Vallabh Prakashan, Delhi 2014.
2. R. S. Gaud and G.D, *Gupta Practical Pharmaceutics*, CBS Publishers & Distributors, 2019.
3. H.C. Ansel et al., *Pharmaceutical Dosage Form and Drug Delivery System*, Lippincott Williams and Walkins, New Delhi, 2010.
4. Francoise Nieloud and Gilberte Marti-Mestres: *Pharmaceutical Emulsions and Suspensions*, Marcel Dekker, INC, New York, 2000.

Course outcome

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
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CO-1	Able to understand, select, and apply appropriate extraction techniques, solvent systems, purification and drying methods, and classify major phytoconstituents based on their chemical nature for effective analysis and processing of plant-derived products.	An	PSO-1,2
CO-2	Ability to prepare and evaluate herbal cosmetic formulations and understand the sources, active constituents, and cosmetic applications of key herbal ingredients used in skincare and beauty products.	An	PSO5
CO-3	Able to understand the nomenclature, structures, and classifications of key heterocyclic compounds, recognize important fused and natural heterocycles including alkaloids and vitamins, and relate them to their sources, structures, and therapeutic applications.	E	PSO4
CO-4	Able to understand and apply the principles, instrumentation, and applications of major chromatographic and electrophoretic techniques, and perform qualitative analysis of primary and secondary metabolites such as alkaloids, carbohydrates, glycosides, saponins, proteins, phenolics, and oils.	C	PSO4
CO-5	Able to perform pharmacopeial limit tests, formulate and dispense standard dosage forms with proper packaging and labeling, estimate hardness ions in water, and qualitatively detect primary and secondary metabolites essential for pharmaceutical analysis. Develop skill in doing thin layer chromatography.	C	PSO3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: MEDICINAL AND PHARMACEUTICAL CHEMISTRY II

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PSO-1,2	U	F	L	-



2	CO-2	PSO5	R, U	C, P	L/T	-
3	CO-3	PSO4	R, U, A	F, C	L/T	-
4	CO-4	PSO4	R, U, A	C, P	L	-
5	CO-5	PSO3	R, C	C, P	L/T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	3	-	-	-	-	-	1	-	-	-	-	-
CO 2	-	-	-	-	3	2	-	-	-	-	-	-	-
CO 3	-	-	-	2	-	-	-	1	-	-	-	-	-
CO 4	-	-	-	2	-	-	-	2	-	-	-	-	-
CO 5	-	-	3	-	-	-	-	-	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	✓

