BOARD OF D.PHARM. EXAMINATIONS
DIRECTORATE OF MEDICAL EDUCATION
GOVERNMENT OF KERALA.

CIRCULAR

The Regulation & Syllabus of **Diploma in Pharmacy** (**D. Pharm**), Directorate of Medical Education, Government of Kerala are as per **Education Regulation 2020** of Pharmacy Council of India (PCI) from 2021-2022 admission onwards.

(Refer the attached document for the Syllabus and the Scheme for regular practical classes, for the courses of D. Pharm Part I and Part II)

Trivandrum
07/ 05 /2022

Sd/
Chairperson
Board of D. Pharm Examinations

BOARD OF D.PHARM. EXAMINATIONS
DIRECTORATE OF MEDICAL EDUCATION
GOVERNMENT OF KERALA.

SYLLABUS
&
Scheme for Regular Practical Classes

Diploma In Pharmacy (D. Pharm)
DIRECTORATE OF MEDICAL EDUCATION
Government of Kerala.

Based on
PHARMACY COUNCIL OF INDIA(PCI)
EDUCATION REGULATIONS 2020.

2021-2022 ADMISSION ONWARDS.

CONTENTS

Note: -

The students are required to maintain a practical record for each of the practical subject, to be certified by the faculty-in-charge **before registering for final Board examination** of D. Pharm Part I and Part II, and produce at the time of the final practical board Examination, for regular and subsequent appearances.

I. D. PHARM PART I

a. No of Hours

Sl. No	Subject	No of Hours/week			Total No of Hours		
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
1	Pharmaceutics	3	3	1	75	75	25
2	Pharmaceutical Chemistry	3	3	1	75	75	25
3	Pharmacognosy	3	3	1	75	75	25
4	Human Anatomy & Physiology	3	3	1	75	75	25
5	Social Pharmacy	3	3	1	75	75	25
				Total	**375**	**375**	**125**

b. Syllabus.

Note:

The original syllabus mandated by the **Pharmacy council of India** (PCI) for different theory and practical courses of D. Pharm Part I is given here. For the syllabus of theory courses a column is added on the right side and certain clarifications/additions are given for some topics. Wherever such clarifications/additions are given, **refer both** the original syllabus in **column II and** the clarifications/additions in **column IV.**

Books recommended for each subject are appended at the end of each.

PHARMACEUTICS – THEORY

Course Code: ER20-11T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge and skills on the art and science of formulating and dispensing different pharmaceutical dosage forms.

Course Objectives: This course will discuss the following aspects of pharmaceutical dosage forms
1. Basic concepts, types and need
2. Advantages and disadvantages, methods of preparation / formulation
3. Packaging and labeling requirements
4. Basic quality control tests, concepts of quality assurance and good manufacturing practices

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe about the different dosage forms and their formulation aspects
2. Explain the advantages, disadvantages, and quality control tests of different dosage forms
3. Discuss the importance of quality assurance and good manufacturing practices

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarification
1	• History of the Profession of Pharmacy in India in relation to Pharmacy Education, Industry, Pharmacy Practice, and various professional associations. • Pharmacy as a career. • Pharmacopoeia: Introduction to IP, BP, USP, NF and Extra Pharmacopoeia. Salient features of Indian Pharmacopoeia.	**7**	

2	**Packaging materials:** Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials	**5**	
3	**Pharmaceutical aids:** Organoleptic (Colouring, flavouring, and sweetening) agents. **Preservatives:** Definition, types with examples and uses.	**3**	
4	**Unit operations:** Definition, objectives / applications, principles, construction, and working of: **Size reduction**: hammer mill and ball mill. **Size separation:** Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves. **Mixing:** Double cone blender, Turbine mixer, Triple roller mill and Silverson mixer homogenizer. **Filtration:** Theory of filtration, membrane filter and sintered glass filter. **Drying**: Working of fluidized bed dryer and process of freeze drying. **Extraction:** Definition, Classification, methods and applications.	**9**	
5	**Tablets:** Coated and uncoated, various modified tablets (sustained release, extended –release, fast dissolving, multi-layered etc.	**8**	Include definition & different types of compressed tablets, tablet excipients, processes involved in the production of tablets, evaluation of tablets, defects in tablets. Brief description on different types of tablet coating Brief description on modified tablets (sustained release, extended release, fast dissolving, multi-layered.)
	Capsules: Hard and Soft Gelatin capsules.	**4**	Include different sizes of capsules, filling and handling of hard and soft gelatin capsules. Evaluation of capsules.
	Liquid oral preparations: Solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution.	**4**	Include definition with examples of solutions, syrup, elixirs and dry powder for reconstitution for oral use. Emulsion- Types, identification of emulsion systems, emulsifying agents, formulation and preparation of emulsions, instabilities in emulsions. Suspension- An introduction to flocculated/ non-flocculated suspensions, formulation of suspensions.

	Topical preparations: Ointments, creams, pastes, gels, liniments and lotions, suppositories and pessaries.	**8**	Include definition and preparation of creams, pastes, gels, liniments and lotions. Ointments-classification of ointment bases, preparation of ointments.
			Suppositories and pessaries: classification of suppositories, suppository bases, displacement value, preparation of suppositories. Definition of pessaries
	Nasal preparations, Ear preparations	**2**	
	Powders and granules: insufflations, dusting powders, effervescent powders and effervescent granules.	**3**	
	Sterile formulations: Injectables, Eyedrops and eye ointments.	**6**	Sterile formulations: **Injections**--definition, Advantages, disadvantages, classification, vehicles and adjuvants used in injections, Water for Injection, Pyrogen tests, Sterility tests. Leaker test & clarity test. **Eye drops, eye lotions and eye ointments.**
	Immunological products: Sera, vaccines toxoids and their manufacturing methods.	**5**	Include definition and classification of immunity**.** Classification of immunological products with examples in each category, definition of vaccines, sera and toxoids. Diagnostic products for Schick test &Tuberculin test. Preparation of BCG vaccine, cholera vaccine, diphtheria toxoid, tetanus toxoid, Rabies antisera-equine and human.
6	**Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants**. **Quality control and quality assurance**: Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP), Introduction to the concept of calibration and validation	**5**	
7	**Novel drug delivery systems**: Introduction, classification with examples, advantages and challenges.	**5**	Include a brief study on nanoparticles, liposomes, implants, ocuserts and osmotic pumps.

PHARMACEUTICS – PRACTICAL

Course Code: ER20-11P **75 Hours (3 Hours/week)**

Scope: This course is designed to train the students in formulating and dispensing common pharmaceutical dosage forms.
Course Objectives: This course will discuss and train the following aspects of preparing and dispensing various pharmaceutical dosage forms.
1. Calculation of working formula from the official master formula
2. Formulation of dosage forms based on working formula
3. Appropriate Packaging and labelling requirements
4. Methods of basic quality control tests

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Calculate the working formula from the given master formula
2. Formulate the dosage form and dispense in an appropriate container
3. Design the label with the necessary product and patient information
4. Perform the basic quality control tests for the common dosage forms

Practicals

1. Handling and referring the official references: Pharmacopoeias, Formularies, etc. for retrieving formulas, procedures, etc.
2. Formulation of the following dosage forms as per monograph standards and dispensing with appropriate packaging and labelling
    - **Liquid Oral**: Simple syrup, Piperazine citrate elixir, Aqueous Iodine solution
    - **Emulsion**: Castor oil emulsion, Cod liver oil emulsion
    - **Suspension**: Calamine lotion, Magnesium hydroxide mixture
    - **Ointment**: Simple ointment base, Sulphur ointment
    - **Cream:** Cetrimide cream
    - **Gel**: Sodium alginate gel
    - **Liniment**: Turpentine liniment, White liniment BPC
    - **Dry powder**: Effervescent powder granules, Dusting powder
    - **Sterile Injection**: Normal Saline, Calcium gluconate Injection
    - **Hard Gelatin Capsule**: Tetracycline capsules
    - **Tablet:** Paracetamol tablets
3. Formulation of at least five commonly used cosmetic preparations – e.g. cold cream, shampoo, lotion, toothpaste etc.
4. Demonstration on various stages of tablet manufacturing processes
5. Appropriate methods of usage and storage of all dosage forms including special dosage such as different types of inhalers, spacers, insulin pens
6. Demonstration of quality control tests and evaluation of common dosage forms viz. tablets, capsules, emulsion, sterile injections as per the monographs

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student).
1. Various systems of measures commonly used in prescribing, compounding and dispensing practices.

2. Market preparations (including Fixed Dose Combinations) of each type of dosage forms, their generic name, minimum three brand names and label contents of the dosage forms mentioned in theory/practical.
3. Overview of various machines / equipments / instruments involved in the formulation and quality control of various dosage forms / pharmaceutical formulations.
4. Overview of extemporaneous preparations at community / hospital pharmacy vs. manufacturing of dosage forms at industrial level.
5. Basic pharmaceutical calculations: ratios, conversion to percentage fraction, alligation, proof spirit, isotonicity.

Field Visit

The students shall be taken for an industrial visit to pharmaceutical industries to witness and understand the various processes of manufacturing of any of the common dosage forms viz. tablets, capsules, liquid orals, injectables, etc. Individual reports from each student on their learning experience from the field visit shall be submitted.

Recommended Books (Latest Edition)

1. History of Pharmacy in India by Dr. Harikishan Singh
2. Indian Pharmacopoeia, Govt. of India Publication
3. A Text book of Pharmaceuticals Formulation by B.M. Mithal, Vallabh Prakashan.
4. Bentleys' Text book of Pharmaceutics, Editor E.A. Rawlins, Elsevier Int.,
5. The Theory and Practice of Industrial Pharmacy. Leon Lachman, Herbert Lieberman and Joseph Kanig, Editors, Lea and Febiger, Philadelphia. Varghese Publishing House
6. Responsible Use of Medicines: A Layman's Handbook, www.ipapharma.org / publications

PHARMACEUTICAL CHEMISTRY – THEORY

Course Code: ER20-12T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge on the chemical structure, storage conditions and medicinal uses of organic and inorganic chemical substances used as drugs and pharmaceuticals. Also, this course discusses the impurities, quality control aspects of chemical substances used in pharmaceuticals.

Course Objectives: This course will discuss the following aspects of the chemical substances used as drugs and pharmaceuticals for various disease conditions

1. Chemical classification, chemical name, chemical structure
2. Pharmacological uses, doses, stability and storage conditions
3. Different types of formulations / dosage form available and their brand names
4. Impurity testing and basic quality control tests

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the chemical class, structure and chemical name of the commonly used drugs and pharmaceuticals of both organic and inorganic nature
2. Discuss the pharmacological uses, dosage regimen, stability issues and storage conditions of all such chemical substances commonly used as drugs
3. Describe the quantitative and qualitative analysis, impurity testing of the chemical substances given in the official monographs
4. Identify the dosage form & the brand names of the drugs and pharmaceuticals popular in the marketplace

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications.
1	**Introduction to Pharmaceutical chemistry**: Scope and objectives **Sources and types of errors**: Accuracy, precision, significant figures **Impurities in Pharmaceuticals**: Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.	**8**	
2	**Volumetric analysis**: Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration, redox titration **Gravimetric analysis**: Principle and method.	**8**	
3	**Inorganic Pharmaceuticals**: Pharmaceutical formulations, market preparations, storage conditions and uses of **Haematinics:** Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron **Gastro-intestinal Agents**: Antacids: Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate. Acidifying agents, Adsorbents, Protectives, Cathartics. **Topical agents:** Silver Nitrate, Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate **Dental products:** Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouth washes **Medicinal gases:** Carbon dioxide, nitrous oxide, oxygen	**7**	Adsorbents & Protectives include- Activated charcoal, light kaolin. Bismuth sub carbonate. Cathartics include Magnesium sulphate, & Sodium potassium tartrate.
4	Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to Three rings	**2**	
Study of the following category of medicinal compounds with respect to classification, chemical name, chemical structure (compounds marked with*) uses, stability and storage conditions, different types of formulations and their popular brand names			**Include minimum two formulations and popular brand names for each drug**
5	**Drugs Acting on Central Nervous System** **Anaesthetics:** Thiopental Sodium*, Ketamine Hydrochloride*, Propofol **Sedatives and Hypnotics**: Diazepam*, Alprazolam*, Nitrazepam, Phenobarbital* **Antipsychotics:** Chlorpromazine Hydrochloride*, Haloperidol*, Risperidone*, Sulpiride*, Olanzapine, Quetiapine, Lurasidone **Anticonvulsants:** Phenytoin*, Carbamazepine*, Clonazepam, Valproic Acid*, Gabapentin*, Topiramate, Vigabatrin, Lamotrigine **Anti-Depressants**: Amitriptyline Hydrochloride*, Imipramine Hydrochloride*, Fluoxetine*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine	**9**	

6	**Drugs Acting on Autonomic Nervous System** **Sympathomimetic Agents:** ***Direct Acting****:* Nor- Epinephrine*, Epinephrine, Phenylephrine, Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. ***Indirect Acting Agents****:* Hydroxy Amphetamine, Pseudoephedrine. Agents With Mixed Mechanism: Ephedrine, Metaraminol **Adrenergic Antagonists**: Alpha Adrenergic Blockers: Tolazoline, Phentolamine Phenoxybenzamine, Prazosin. Beta Adrenergic Blockers: Propranolol*, Atenolol*, Carvedilol **Cholinergic Drugs and Related Agents:** Direct Acting Agents: Acetylcholine*, Carbachol, And Pilocarpine. Cholinesterase Inhibitors: Neostigmine*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiopate Iodide **Cholinergic Blocking Agents:** Atropine Sulphate*, Ipratropium Bromide ***Synthetic Cholinergic Blocking Agents*****:** Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*	**9**	
7	**Drugs Acting on Cardiovascular System** **Anti-Arrhythmic Drugs**: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcainide Hydrochloride, Amiodarone and Sotalol **Anti-Hypertensive Agents**: Propranolol*, Captopril*, Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine, **Antianginal Agents**: Isosorbide Dinitrate	**5**	
8	**Diuretics:** Acetazolamide, Frusemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone	**2**	
9	**Hypoglycemic Agents**: Insulin and Its Preparations,Metformin*,Glibenclamide*,Glimepiride, Pioglitazone, Repaglinide, Gliflozins,Gliptins	**3**	
10	**Analgesic And Anti-Inflammatory Agents**: Morphine Analogues, Narcotic Antagonists; **Nonsteroidal Anti- Inflammatory Agents (NSAIDs) -** Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac	**3**	

11	**Anti-Infective Agents** **Antifungal Agents**:Amphotericin-B,Griseofulvin,Miconazole,Ketoconazole*,Itraconazole, Fluconazole*, NaftifineHydrochloride **Urinary Tract Anti-Infective Agents:** Norfloxacin, Ciprofloxacin, Ofloxacin*,Moxifloxacin, **Anti-Tubercular Agents:** INH*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid,Pretomanid* **Antiviral Agents**: Amantadine Hydrochloride, Idoxuridine, Acyclovir*, Foscarnet, Zidovudine, Ribavirin, Remdesivir,Favipiravir **Antimalarials**: Quinine Sulphate, Chloroquine Phosphate*, Primaquine Phosphate, Mefloquine*, Cycloguanil, Pyrimethamine,Artemisinin **Sulfonamide**s: Sulfanilamide, Sulfadiazine,Sulfamethoxazole, Sulfacetamide*, Mafenide Acetate, Cotrimoxazole, Dapsone*	**8**	
12	**Antibiotics:** Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin, ***Tetracyclines:*** Doxycycline, Minocycline, ***Macrolides:*** Erythromycin, Azithromycin, ***Miscellaneous:*** Chloramphenicol* Clindamycin	**8**	
13	**Anti-Neoplastic Agents**: Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin*, Dromostanolone Propionate	**3**	

PHARMACEUTICAL CHEMISTRY – PRACTICAL

Course Code: ER20-12P **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic training and hands-on experiences to synthesise chemical substances used as drugs and pharmaceuticals. Also, to perform the quality control tests, impurity testing, test for purity and systematic qualitative analysis of chemical substances used as drugs and pharmaceuticals.

Course Objectives: This course will provide the hands-on experience on the following aspects of chemical substances used as drugs and pharmaceuticals

1.Limit tests and assays of selected chemical substances as per the monograph
2.Volumetric analysis of the chemical substances
3.Basics of preparatory chemistry and their analysis
4.Systematic qualitative analysis for the identification of the chemical drugs

Course Outcomes: Upon successful completion of this course, the students will be able to

1.Perform the limit tests for various inorganic elements and report
2.Prepare standard solutions using the principles of volumetric analysis
3.Test the purity of the selected inorganic and organic compounds against the monograph standards
4.Synthesize the selected chemical substances as per the standard synthetic scheme
5.Perform qualitative tests to systematically identify the unknown chemical substances

Practicals

1. **Limit test for** Chlorides; Sulphate; Iron; Heavy metals
2. Identification tests for Anions and Cations as per Indian Pharmacopoeia
3. **Fundamentals of Volumetric analysis**: Preparation of standard solution and standardization of Sodium Hydroxide, Potassium Permanganate
4. **Assay of the following compounds:**
    - Ferrous sulphate- by redox titration
    - Calcium gluconate-by complexometric
    - Sodium chloride-by Modified Volhard's method
    - Ascorbic acid by iodometry
    - Ibuprofen by alkalimetry
5. **Fundamentals of preparative organic chemistry**: Determination of Melting point and boiling point of organic compounds
6. **Preparation of organic compounds**:
    - Benzoic acid from Benzamide
    - Picric acid from Phenol
7. **Identification and test for purity of pharmaceuticals**: Aspirin, Caffeine, Paracetamol, Sulfanilamide
8. Systematic Qualitative analysis experiments (4 substances)

Assignments

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1.Different monographs and formularies available and their major contents
2.Significance of quality control and quality assurance in pharmaceutical industries
3.Overview on Green Chemistry
4.Various software programs available for computer aided drug discovery
5.Various instrumentations used for characterization and quantification of drugs

Recommended Books (Latest Edition)

1.Medicinal & Pharmaceutical chemistry by Harikishan Singh and VK Kapoor
2.Wilson and Gisvold’s Text book of Organic Medicinal and Pharmaceutical Chemistry
3.Practical Organic Chemistry by Mann and Saunders.
4.Practical Pharmaceutical Chemistry, Volume- I & II by Beckett and J. B. Stenlake
5.Indian Pharmacopoeia
6.Vogel’s text book of Practical Organic Chemistry

PHARMACOGNOSY – THEORY

Course Code: ER20-13T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart knowledge on the medicinal uses of various drugs of natural origin. Also, the course emphasizes the fundamental concepts in the evaluation of crude drugs, alternative systems of medicine, nutraceuticals, and herbal cosmetics.

Course Objectives: This course will discuss the following aspects of drug substances derived from natural resources.

1. Occurrence, distribution, isolation, identification tests of common phytoconstituents
2. Therapeutic activity and pharmaceutical applications of various natural drug substances and phytoconstituents
3. Biological source, chemical constituents of selected crude drugs and their therapeutic efficacy in common diseases and ailments
4. Basic concepts in quality control of crude drugs and various system of medicines
5. Applications of herbs in health foods and cosmetics

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Identify the important/common crude drugs of natural origin
2. Describe the uses of herbs in nutraceuticals and cosmeceuticals
3. Discuss the principles of alternative system of medicines
4. Describe the importance of quality control of drugs of natural origin

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	Definition, history, present status and scope of Pharmacognosy	2	
2	**Classification of drugs**: Alphabetical; Taxonomical; Morphological; Pharmacological; Chemical; Chemo-taxonomical	4	
3	**Quality control of crude drugs**: • Different methods of adulteration of crude drugs • Evaluation of crude drugs	6	Evaluation of crude drugs include morphological, microscopical, physical, chemical & biological evaluation.
4	Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.	6	Identification tests include the following chemical tests- Tests for cardiac glycosides, Borntrager's test, Thalleoquin's test, Murexide test, Goldbeaters skin test, Vitali-Morin test, Van-Urk's test.
5	Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs Laxatives: Aloe, Castor oil, Ispaghula, Senna Cardiotonic: Digitalis, Arjuna	30	

	Carminatives and G.I. regulators: Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon Astringents: Myrobalan, Black Catechu, Pale Catechu Drugs acting on nervous system: Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca Anti-hypertensive: Rauwolfia Anti-tussive: Vasaka, Tolu Balsam Anti-rheumatics: Colchicum seed Anti-tumour: Vinca, Podophyllum Antidiabetics: Pterocarpus, Gymnema Diuretics: Gokhru, Punarnava Anti-dysenteric: Ipecacuanha Antiseptics and disinfectants: Benzoin, Myrrh, Neem, Turmeric Antimalarials: Cinchona, Artemisia Oxytocic: Ergot Vitamins: Cod liver oil, Shark liver oil Enzymes: Papaya, Diastase, Pancreatin, Yeast Pharmaceutical Aids: Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatine Miscellaneous: Squill, Galls, Ashwagandha, Tulsi, Guggul		
6	**Plant fibres used as surgical dressings**: Cotton, silk, wool and regenerated fibres Sutures- Surgical Catgut and ligatures	3	Include different types of fibres used as surgical dressings: Cotton, silk, wool, regenerated fibres (viscose, alginate) - Surgical sutures & ligatures
7	**Basic principles involved in the traditional systems of medicine** like: Ayurveda, Siddha, Unani and Homeopathy **Method of preparation of Ayurvedic formulations** like Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma.	8	
8	Role of medicinal and aromatic plants in national economy and their export potential	2	
9	**Herbs as health food**: Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic	4	
10	Introduction to herbal formulations.	4	Include definition, Types of herbal formulation- Modern herbal dosage forms
11	**Herbal cosmetics**: Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil,Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil	4	

12	Phytochemical investigation of drugs:	2	Include different extraction processes for phytochemicals such as Maceration, Percolation, Soxhlet extraction. Phytochemical screening of alkaloids, glycosides, tannins, carbohydrates and proteins.

PHARMACOGNOSY – PRACTICAL

Course Code: ER20-13P **75 Hours (3 Hours/week)**

Scope: This course is designed to train the students in physical identification, morphological characterization, physical and chemical characterization, and evaluation of commonly used herbal drugs.

Course Objectives: This course will provide hands-on experiences to the students in
1. Identification of the crude drugs based on their morphological characteristics
2. Various characteristic anatomical characteristics of the herbal drugs studied through transverse section
3. Physical and chemical tests to evaluate the crude drugs

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Identify the given crude drugs based on the morphological characteristics
2. Take a transverse section of the given crude drugs
3. Describe the anatomical characteristics of the given crude drug under microscopical conditions
4. Carry out the physical and chemical tests to evaluate the given crude drugs

Practicals

1. **Morphological Identification of the following drugs**:
Ispaghula, Senna, Coriander, Fennel, Cardamom, Ginger, Nutmeg, Black Pepper, Cinnamon, Clove,Ephedra, Rauwolfia, Gokhru, Punarnava, Cinchona, Agar.

2. **Gross anatomical studies (Transverse Section) of the following drugs**: Ajwain, Datura, Cinnamon, Cinchona, Coriander, Ashwagandha, Liquorice, Clove, Curcuma, Nux vomica, Vasaka

3. **Physical and chemical tests for evaluation of any FIVE of the following drugs:**
Asafoetida, Benzoin, Pale catechu, Black catechu, Castor oil, Acacia, Tragacanth, Agar, Guar gum, Gelatine.

Assignments

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)
1. Market preparations of various dosage forms of Ayurvedic, Unani, Siddha, Homeopathic (Classical and Proprietary), indications, and their labelling requirements
2. Market preparations of various herbal formulations and herbal cosmetics, indications, and their labelling requirements

3. Herb-Drug interactions documented in the literature and their clinical significances

Field Visit

The students shall be taken in groups to a medicinal garden to witness and understand the nature of various medicinal plants discussed in theory and practical courses. Additionally, they shall be taken in groups to the pharmacies of traditional systems of medicines to understand the availability of various dosage forms and their labelling requirements. Individual reports from each student on their learning experience from the field visit shall be submitted.

Recommended Books (Latest Edition)

1. Text book of Pharmacognosy by C. K. Kokate, S. B. Gokhale, A.P. Purohit, Nirali Prakashan
2. Text book of Pharmacognosy by C.S. Shah and J. S. Qadry, CBS Publishers & Distributors Pvt. Ltd.
3. Text Book of Pharmacognosy by T. E. Wallis. CBS Publishers & Distributors Pvt. Ltd.
4. Study of crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal
5. Powder crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal
6. Anatomy of crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal
7. Augmented Text Book of Homeopathic Pharmacy by Dr. D D Banerjee, B Jain Publishers (P)

HUMAN ANATOMY AND PHYSIOLOGY – THEORY

Course Code: ER20-14T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge on the structure and functions of the human body. It helps in understanding both homeostasis mechanisms and homeostatic imbalances of various systems of the human body.

Course Objectives: This course will discuss the following:
1. Structure and functions of the various organ systems and organs of the human body
2. Homeostatic mechanisms and their imbalances in the human body
3. Various vital physiological parameters of the human body and their significances

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe the various organ systems of the human body
2. Discuss the anatomical features of the important human organs and tissues
3. Explain the homeostatic mechanisms regulating the normal physiology in the human system
4. Discuss the significance of various vital physiological parameters of the human body

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	Scope of Anatomy and Physiology; Definition of various terminologies.	**2**	
2	**Structure of Cell:** Components and its functions.	**2**	
3	**Tissues of the human body**: Epithelial, Connective, Muscular and Nervous tissues– their sub-types and characteristics.	**4**	

4	**Osseous system:** structure and functions of bones of axial and appendicular skeleton; Classification, types and movements of joints, disorders of joints.	**6**	
5	**Haemopoietic system:** Composition and functions of blood; Process of Hemopoiesis; Characteristics and functions of RBCs, WBCs and platelets; Mechanism of Blood Clotting; Importance of Blood groups.	**8**	
6	**Lymphatic system:** Lymph and lymphatic system, composition, function and its formation; Structure and functions of spleen and lymph node.	**3**	
7	**Cardiovascular system:** Anatomy and Physiology of heart; Blood vessels and circulation (Pulmonary, coronary and systemic circulation); Cardiac cycle and Heart sounds, Basics of ECG; Blood pressure and its regulation.	**8**	
8	**Respiratory system**: Anatomy of respiratory organs and their functions; Regulation, and Mechanism of respiration; Respiratory volumes and capacities – definitions.	**4**	
9	**Digestive system:** Anatomy and Physiology of the GIT; Anatomy and functions of accessory glands; Physiology of digestion and absorption.	**8**	
10	**Skeletal muscles:** Histology; Physiology of muscle contraction; Disorder of skeletal muscles.	**2**	
11	**Nervous system:** Classification of nervous system; Anatomy and physiology of cerebrum, cerebellum, mid brain; Function of hypothalamus, medulla oblongata and basal ganglia; Spinal cord-structure and reflexes; Names and functions of cranial nerves; Anatomy and physiology of sympathetic and parasympathetic nervous system (ANS).	**8**	
12	**Sense organs: Anatomy and physiology of** Eye, Ear, Skin, Tongue, Nose.	**6**	
13	**Urinary system**: Anatomy and physiology of urinary system; Physiology of urine formation; Renin - angiotensin system; Clearance tests and micturition.	**4**	
14	**Endocrine system** (Hormones and their functions): Pituitary gland, Adrenal gland, Thyroid and parathyroid gland, Pancreas and gonads.	**6**	
15	**Reproductive system**: Anatomy of male and female reproductive system; Physiology of menstruation; Spermatogenesis and Oogenesis; Pregnancy and parturition.	**4**	

HUMAN ANATOMY AND PHYSIOLOGY – PRACTICAL

Course Code: ER20-14P **75 Hours (3 Hours/week)**

Scope: This course is designed to train the students and instil the skills for carrying out basic physiological monitoring of various systems and functions.

Course Objectives: This course will provide hands-on experience in the following:

1. General blood collection techniques and carrying out various haematological assessments and interpreting the results
2. Recording and monitoring the vital physiological parameters in human subjects and the basic interpretations of the results
3. Microscopic examinations of the various tissues permanently mounted in glass slides
4. Discuss the anatomical and physiological characteristics of various organ systems of the body using models, charts, and other teaching aids

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Perform the haematological tests in human subjects and interpret the results
2. Record, monitor and document the vital physiological parameters of human subjects and interpret the results
3. Describe the anatomical features of the important human tissues under the microscopical conditions
4. Discuss the significance of various anatomical and physiological characteristics of the human body

Practicals

1. Study of compound microscope
2. General techniques for the collection of blood
3. Microscopic examination of Epithelial tissue, Cardiac muscle, Smooth muscle, Skeletal muscle, Connective tissue, and Nervous tissue of ready / pre-prepared slides.
4. Study of Human Skeleton-Axial skeleton and appendicular skeleton
5. Determination of
    a. Blood group
    b. ESR
    c. Haemoglobin content of blood
    d. Bleeding time and Clotting time
6. Determination of WBC count of blood
7. Determination of RBC count of blood
8. Determination of Differential count of blood
9. Recording of Blood Pressure in various postures, different arms, before and after exertion and interpreting the results
10. Recording of Body temperature (using mercury, digital and IR thermometers at various locations), Pulse rate/ Heart rate (at various locations in the body, before and after exertion), Respiratory Rate
11. Recording Pulse Oxygen (before and after exertion)
12. Recording force of air expelled using Peak Flow Meter
13. Measurement of height, weight, and BMI
14. Study of various systems and organs with the help of chart, models, and specimens:
    a) Cardiovascular system
    b) Respiratory system
    c) Digestive system
    d) Urinary system
    e) Endocrine system
    f) Reproductive system
    g) Nervous system
    h) Eye
    i) Ear
    j) Skin

Recommended Books (Latest Edition)
1. Human Physiology by C. C. Chatterjee
2. Human Anatomy and Physiology by S. Chaudhary and A. Chaudhary
3. Derasari and Gandhi's elements of Human Anatomy, Physiology and Health Education
4. S.R. Kale and R.R. Kale, Textbook of Practical Anatomy and Physiology
5. Ross and Wilson Anatomy and Physiology in Health and illness
6. Human Anatomy and Physiology by Tortora Gerard J
7. Fundamentals of Medical Physiology by K. Sambulingam and P Sambulingam
8. Ranade V.G. Text Book of Practical Physiology

9. Goyal R.K., Natvar M.P. and Shah S.A., Practical Anatomy, Physiology and Biochemistry, Experimental Physiology

SOCIAL PHARMACY – THEORY

Course Code: ER20-15T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge on public health, epidemiology, preventive care, and other social health related concepts. Also, to emphasize the roles of pharmacists in the public health programs.

Course Objectives: This course will discuss about basic concepts of
1. Public health and national health programs
2. Preventive healthcare
3. Food and nutrition related health issues
4. Health education and health promotion
5. General roles and responsibilities of pharmacists in public health

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Discuss about roles of pharmacists in the various national health programs
2. Describe various sources of health hazards and disease preventive measures
3. Discuss the healthcare issues associated with food and nutritional substances
4. Describe the general roles and responsibilities of pharmacists in public health

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	**Introduction to Social Pharmacy**: • Definition and Scope. Social Pharmacy as a discipline and its scope in improving the public health. Role of Pharmacists in Public Health. (2) • Concept of Health -WHO Definition, various dimensions, determinants, and health indicators. (3) • National Health Policy – Indian perspective (1) • Public and Private Health System in India, National Health Mission (2) • Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals (1)	**9**	
2	**Preventive healthcare – Role of Pharmacists in the following:** • Demography and Family Planning (3) • Mother and child health, importance of breastfeeding, ill effects of infant milk substitutes and bottle feeding (2) • Overview of Vaccines, types of immunity and immunization (4) • Effect of Environment on Health – Water pollution, importance of safe drinking water,	**18**	

	waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses, Environmental pollution due to pharmaceuticals (7) • Psychosocial Pharmacy: Drugs of misuse and abuse – psychotropics, narcotics, alcohol, tobacco products. Social Impact of these habits on social health and productivity and suicidal behaviours (2)		
3	**Nutrition and Health**: • Basics of nutrition – Macronutrients and Micronutrients (3) • Importance of water and fibres in diet (1) • Balanced diet, Malnutrition, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food (3) • Introduction to food safety, adulteration of foods, effects of artificial ripening, use of pesticides, genetically modified foods (1) • Dietary supplements, nutraceuticals, food supplements– indications, benefits, Drug-Food Interactions (2)	**10**	
4	Introduction to Microbiology and common microorganisms (3) **Epidemiology:** Introduction to epidemiology, and its applications. Understanding of terms such as epidemic, pandemic, endemic, mode of transmission, outbreak, quarantine, isolation, incubation period, contact tracing, morbidity, mortality (2) Causative agents, epidemiology and clinical presentations and Role of Pharmacists in educating the public in prevention of the following communicable diseases: • Respiratory infections – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1, SARS, MERS, COVID-19), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis, Ebola (7) • Intestinal infections – poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning (7) • Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya (4) • Surface infections – trachoma, tetanus, leprosy (2) • STDs, HIV/AIDS (3)	**28**	

5	Introduction to health systems and **all ongoing National Health programs in India,** their objectives, functioning, outcome, and the role of pharmacists.	**8**	Introduce different programs giving emphasis to the following:- National Tuberculosis Elimination Program, National Leprosy Control Program, National immunization schedule, Pulse polio immunization program, National Mental Health Program, National Tobacco Control Program, National AIDS Control Program, National Family Welfare Program, National Program for Control of Blindness, National Program for Prevention and Control of Deafness
6	**Pharmacoeconomics –** Introduction, basic terminologies, importance of pharmacoeconomics	**2**	

SOCIAL PHARMACY – PRACTICAL

Course Code: ER20-15P **75 Hours (3 Hours/week)**

Scope: This course is designed to provide simulated experience in various public health and social pharmacy activities.

Course Objectives: This course will train the students on various roles of pharmacists in public health and social pharmacy activities in the following areas:
1. National immunization programs
2. Reproductive and child health programs
3. Food and nutrition related health programs
4. Health education and promotion
5. General roles and responsibilities of the pharmacists in public health
6. First Aid for various emergency conditions including basic life support and cardiopulmonary resuscitation

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe the roles and responsibilities of pharmacists in various National health programs
2. Design promotional materials for public health awareness
3. Describe various health hazards including microbial sources
4. Advice on preventive measures for various diseases
5. Provide first aid for various emergency conditions

Note: Demonstration / Hands-on experience / preparation of charts / models / promotional materials / role plays / enacting / e-brochures / e-flyers / podcasts / video podcasts / any other innovative activities to understand the concept of various elements of social pharmacy listed here. (At least one activity to be carried out for each one of the following):

Practicals

1. National immunization schedule for children, adult vaccine schedule, Vaccines which are not included in the National Immunization Program.
2. RCH – reproductive and child health – nutritional aspects, relevant national health programmes.
3. Family planning devices
4. Microscopical observation of different microbes (readymade slides)
5. Oral Health and Hygiene
6. Personal hygiene and etiquettes – hand washing techniques, Cough and sneeze etiquettes.
7. Various types of masks, PPE gear, wearing/using them, and disposal.
8. Menstrual hygiene, products used
9. First Aid – Theory, basics, demonstration, hands on training, audio-visuals, and practice, BSL (Basic Life Support) Systems [SCA - Sudden Cardiac Arrest, FBAO - Foreign Body Airway Obstruction, CPR, Defibrillation (using AED) (Includes CPR techniques, First Responder).
10. Emergency treatment for all medical emergency cases viz. snake bite, dog bite, insecticide poisoning, fractures, burns, epilepsy etc.
11. Role of Pharmacist in Disaster Management.
12. Marketed preparations of disinfectants, antiseptics, fumigating agents, antilarval agents, mosquito repellents, etc.
13. Health Communication: Audio / Video podcasts, Images, Power Point Slides, Short Films, etc. in regional language(s) for mass communication / education / Awareness on 5 different communicable diseases, their signs and symptoms, and prevention.
14. Water purification techniques, use of water testing kit, calculation of Content/percentage of $KMnO_4$, bleaching powder to be used for wells/tanks
15. Counselling children on junk foods, balanced diets – using Information, Education and Communication (IEC), counselling, etc. (Simulation Experiments).
16. Preparation of various charts on nutrition, sources of various nutrients from Locally available foods, calculation of caloric needs of different groups (e.g. child, mother, sedentary lifestyle, etc.). Chart of glycemic index of foods.
17. Tobacco cessation, counselling, identifying various tobacco containing products through charts/pictures

Assignments

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. An overview of Women's Health Issues
2. Study the labels of various packed foods to understand their nutritional contents
3. Breastfeeding counselling, guidance – using Information, Education and Communication (IEC)
4. Information about the organizations working on de-addiction services in the region (city / district, etc.)
5. Role of a pharmacist in disaster management – A case study
6. Overview on the National Tuberculosis Elimination Programme (NTEP)
7. Drug disposal systems in the country, at industry level and citizen level
8. Various Prebiotics or Probiotics (dietary and market products)
9. Emergency preparedness: Study of local Government structure with respect to Fire, Police departments, health department

10. Prepare poster/presentation for general public on any one of the Health Days. e.g. AIDS Day, Handwashing Day, ORS day, World Diabetes Day, World Heart Day, etc.
11. List of home medicines, their storage, safe handling, and disposal of unused medicines
12. Responsible Use of Medicines: From Purchase to Disposal
13. Collection of newspaper clips (minimum 5) relevant to any one topic and its submission in an organized form with collective summary based on the news items
14. Read a minimum of one article relevant to any theory topic, from Pharma/Science/ or other Periodicals and prepare summary of it for submission
15. Potential roles of pharmacists in rural India

Field Visits

The students shall be taken in groups to visit any THREE of the following facilities to witness and understand the activities of such centres/facilities from the perspectives of the topics discussed in theory and/or practical courses. Individual reports from each student on their learning experience from the field visits shall be submitted.

1. Garbage Treatment Plant
2. Sewage Treatment Plant
3. Bio-medical Waste Treatment Plant
4. Effluent Treatment Plant
5. Water purification plant
6. Orphanage / Elderly-Care-Home / School and or Hostel/Home for persons with disabilities
7. Primary health care centre.

Recommended Books (Latest Edition)

1. Social Pharmacy – Innovation and development. Geoff Harding, Sarah Nettleton and Kevin Taylor. The Pharmaceutical Press.
2. Text Book of Community Pharmacy Practice. RPSGB Publication
3. Community Pharmacy Handbook- Jonathan Waterfield
4. S Khurana, P Suresh & R Kalsi. Health Education & Community Pharmacy. S Vikas & Co
5. Social Pharmacy: Tayler, Geoffrey. Pharmaceutical Press. London.
6. Textbook by Dandiya PC, Zafer ZYK, Zafer A. Health education & Community Pharmacy. Vallabh Prakashan.
7. Websites of Ministry of Health and Family Welfare, National Health Portal
8. Pharmacists at the Frontlines: A Novel Approach at Combating TB www.ipapharma.org Visit Publications
9. Where There Is No Doctor: A Village Health Care Handbook by David Werner, 2015 updated version
10. Various WHO publications

C. Scheme for Regular Practical Classes

PHARMACEUTICS

Major experiments

I. Formulation as per monograph standards and dispensing with appropriate packaging & labelling of the following dosage forms

1. Castor oil emulsion
2. Cod liver oil emulsion
3. Magnesium hydroxide mixture
4. Simple ointment
5. Cetrimide cream
6. Effervescent granules
7. Cold cream
8. Shampoo
9. White liniment
10. Normal saline
11. Calcium gluconate injection
12. Tetracycline capsule
13. Paracetamol tablets

II. Demonstration of quality control tests and evaluation of common dosage forms such as tablets, capsules, emulsion, sterile injections as per the monographs

III. Demonstration on various stages of tablet manufacturing processes

Minor experiments

I. Handling and referring the official references: Pharmacopoeias, Formularies, etc. for retrieving formulas, procedures, etc.

II. Formulation as per monograph standards and dispensing with appropriate packaging & labelling of the following dosage forms

1. Aqueous iodine solution
2. Piperazine citrate elixir
3. Calamine lotion
4. Simple syrup
5. Sodium alginate gel
6. Sulphur ointment from simple ointment
7. Dusting powder
8. Turpentine liniment
9. Tooth paste

III. Demonstration of the methods of usage / storage of different dosage forms including special dosage such as different types of inhalers, spacers, insulin pens.

PHARMACEUTICAL CHEMISTRY

Major Experiments

1. Assay of Ferrous sulphate by redox titration.
2. Assay of Calcium gluconate by complexometry.
3. Assay of Sodium chloride by Modified Volhard's method.
4. Assay of Ascorbic acid by iodimetry.
5. Assay of Ibuprofen by alkalimetry.
6. Systematic Qualitative Analysis of any four chemical substances among the following: Glucose, Sucrose, Benzoic acid, Oxalic acid, Urea and Salicylic acid

Minor experiments

1. Limit test for Chlorides
2. Limit test for Sulphates
3. Limit test for Iron
4. Preparation of standard Oxalic acid solution
5. Standardization of standard Sodium hydroxide solution
6. Standardization of standard Potassium permanganate solution
7. Determination of melting point of an organic compound (solid sample)
8. Determination of boiling point of an organic compound (liquid sample)
9. Preparation of Benzoic acid from Benzamide.
10. Preparation of Picric acid from Phenol.
11. Identification tests for Aspirin and test for purity for the presence of Salicylic acid in Aspirin.
12. Identification tests for Caffeine.
13. Identification tests for Paracetamol and test for purity for the presence of 4-amino phenol in Paracetamol.
14. Identification tests for Sulfanilamide.
15. Identification tests for Anions and Cations

Note: Accurate weighing of sample for volumetric analysis can be done using digital electronic balance. Operation of Analytical balance should be demonstrated to the students.

PHARMACOGNOSY

Major Experiments

Gross anatomical studies using transverse section of the following crude drugs:

Ajwain, Datura, Cinnamon, Cinchona
Coriander, Ashwagandha, Liquorice, Clove
Curcuma, Nux vomica, Vasaka

Minor experiments

1.Morphological studies of the following drugs:
Ispaghula, Senna, Coriander, Fennel, Cardamom, Ginger, Nutmeg, Black Pepper, Cinnamon, Clove, Ephedra, Rauwolfia, Gokhru, Punarnava, Cinchona, Agar.

2.Physical and chemical tests for evaluation of the following drugs: (Any five)
Asafoetida, Benzoin, Pale catechu, Black catechu, Castor oil, Acacia, Tragacanth, Agar, Guar gum, Gelatin.

HUMAN ANATOMY AND PHYSIOLOGY

Major Experiments

1. Determination of WBC count of blood
2. Determination of RBC count of blood
3. Determination of Differential count of blood
4. Recording of Blood Pressure in various postures, different arms, before and after exertion and interpretation of results

Minor Experiments

1. Study of compound microscope
2. General techniques for the collection of blood
3. Determination of Blood group
4. Determination of ESR
5. Determination of Haemoglobin content of blood
6. Determination of Bleeding time and Clotting time
7. Recording of Body temperature
8. Recording of Pulse rate/ Heart rate (before and after exertion)
9. Recording of Respiratory Rate (before and after exertion)
10. Recording Pulse Oxygen (before and after exertion)
11. Recording force of air expelled using Peak Flow Meter
12. Measurement of height, weight, and BMI
13. Study of various systems and organs with the help of chart, models, and specimens:
    a) Cardiovascular system
    b) Respiratory system
    c) Digestive system
    d) Urinary system
    e) Endocrine system
    f) Reproductive system
    g) Nervous system
    h) Eye
    i) Ear
    j) Skin
14. Microscopic examination of Epithelial tissue, Cardiac muscle, Smooth muscle, Skeletal muscle, Connective tissue, and Nervous tissue using ready / pre-prepared slides.
15. Study of Human Skeleton-Axial skeleton and appendicular skeleton

SOCIAL PHARMACY

Major Experiments

1. First Aid- Demonstration and hands on training (wherever applicable) to be given to First Responders for maintaining proper Basic Life Support in conditions such as
- Airway obstruction by foreign body
- Sudden Cardiac Arrest/ Ventricular fibrillation (Cardio Pulmonary resuscitation (CPR)/ Automated External Defibrillator (AED).

2. Demonstration of the first aid to be given in various emergency cases like snake bite, dog bite, insecticide poisoning, fractures, burns, epilepsy etc.

3. Health Communication --Preparation of Short Films/ Power Point presentation/ Audio -Video podcasts in regional language for mass communication on 5 different communicable diseases of the locality (signs and symptoms, and prevention using marketed preparations of disinfectants, antiseptics, fumigating agents, antilarval agents, mosquito repellents etc.

4. Preparation of action plan for the effective role of Pharmacist in disasters such as earthquake, floods, mass train /bus /fire accidents, acute food poisoning in a community etc.

5. Simulated counselling experiments using charts/pictures for the following

- Importance of balance diets and disadvantages of junk foods
- Tobacco cessation

6. Demonstration of different water purification techniques including
- Use of water testing kits
- Calculation of the content/percentage of various disinfectants for water purification. ($KMnO_4$, bleaching powder)

Minor Experiments

1. Preparation of charts of National immunization schedule for children, and adult vaccine schedule. Listing out the commonly used vaccines which are not included in the National Immunization Program.
2. Preparation of different information leaflets on reproductive and child health (nutritional aspects, health programmes)
3. Studying the working of different Family planning devices
4. Microscopical observation of different microbes using readymade slides.
5. Collection of containers/ labels of different products for oral health. Preparation of different information leaflets on oral health & hygiene
6. Demonstration and hands on training for Personal hygiene, and etiquettes such as hand washing techniques, Cough and sneeze etiquettes
7. Demonstration of the donning and doffing of Personal protective equipment (PPE) and their proper disposal. Listing out the characteristics of different face masks.
8. Preparation of different information leaflets on Menstrual hygiene and listing out the marketed product for menstruating females.
9. Preparation of charts on nutrition including
    - Charts of glycemic index of commonly used food items
    - Charts depicting the contents of carbohydrates, proteins, fats, minerals, vitamins, fiber, water etc. in different locally available foods.
    - Charts depicting calory needs of different groups such as infants, children, lactating mothers, adults with active/sedentary lifestyle.)

II. D. PHARM– PART- II

a. No of Hours

Sl. No	Subject	No of Hours/week			Total No of Hours		
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
1	Pharmacology	3	2	1	75	50	25
2	Community Pharmacy & Management	3	3	1	75	75	25
3	Biochemistry & Clinical Pathology	3	2	1	75	50	25
4	Pharmacotherapeutics	3	1	1	75	25	25
5	Hospital & Clinical Pharmacy	3	1	1	75	25	25
6	Pharmacy Law & Ethics	3	-	1	75	-	25
				Total	**450**	**225**	**150**

b. Syllabus.

Note:

The original syllabus mandated by the **Pharmacy council of India** (PCI) for different theory and practical courses of D. Pharm Part II is given here. For the syllabus of theory courses a column is added on the right side and certain clarifications/additions are given for some topics. Wherever such clarifications/additions are given, **refer both** the original syllabus in **column II and** the clarifications/additions in **column IV.**

Books recommended for each subject are appended at the end of each

PHARMACOLOGY – THEORY

Course Code: ER20-21T **75 Hours (3 Hours/week)**

Scope: This course provides basic knowledge about different classes of drugs available for the pharmacotherapy of common diseases. The indications for use, dosage regimen, routes of administration, pharmacokinetics, pharmacodynamics, and contraindications of the drugs discussed in this course are vital for successful professional practice.

Course Objectives: This course will discuss the following:
1. General concepts of pharmacology including pharmacokinetics, pharmacodynamics, routes of administration, etc.
2. Pharmacological classification and indications of drugs.
3. Dosage regimen, route of administration mechanisms of action, contraindications of drugs.
4. Common adverse effects of drugs

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe the basic concepts of pharmacokinetics and pharmacodynamics
2. Enlist the various classes and drugs of choices for any given disease condition
3. Advice the dosage regimen, route of administration and contraindications for a given drug
4. Describe the common adverse drug reactions

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	**General Pharmacology** • Introduction and scope of Pharmacology • Various routes of drug administration - advantages and disadvantages • Drug absorption - definition, types, factors affecting drug absorption • Bioavailability and the factors affecting bioavailability • Drug distribution - definition, factors affecting	**10**	

	drug distribution • Biotransformation of drugs - Definition, types of biotransformation reactions, factors influencing drug metabolisms • Excretion of drugs - Definition, routes of drug excretion • General mechanisms of drug action and factors modifying drug action		
2	**Drugs Acting on the Peripheral Nervous System**: • Steps involved in neurohumoral transmission. • Definition, classification, pharmacological actions, dose, indications, and contraindications of: a) Cholinergic drugs b) Anti-Cholinergic drugs c) Adrenergic drugs d) Anti-adrenergic drugs e) Neuromuscular blocking agents f) Drugs used in Myasthenia gravis g) Local anaesthetic agents h) Non-Steroidal Anti-Inflammatory drugs (NSAIDs).	**11**	Include detailed Pharmacology of Acetylcholine, Atropine, Adrenaline, Propranolol and Aspirin
3	**Drugs Acting on the Eye**: Definition, classification, pharmacological actions, dose, indications and contraindications of • Miotics • Mydriatics • Drugs used in Glaucoma	**2**	
4	**Drugs Acting on the Central Nervous System**: Definition, classification, pharmacological actions, dose, indications, and contraindications of • General anaesthetics • Hypnotics and sedatives • Anti-Convulsant drugs • Anti-anxiety drugs • Anti-depressant drugs • Anti-psychotics • Nootropic agents • Centrally acting muscle relaxants • Opioid analgesics	**8**	Include detailed Pharmacology of Phenobarbitone, Diazepam, Phenytoin, Chlorpromazine and Morphine.
5	**Drugs Acting on the Cardiovascular System:** Definition, classification, pharmacological actions, dose, indications, and contraindications of • Anti-hypertensive drugs • Anti-anginal drugs • Anti-arrhythmic drugs • Drugs used in atherosclerosis and • Congestive heart failure • Drug therapy for shock	**6**	Include detailed Pharmacology of Digoxin
6	**Drugs Acting on Blood and Blood Forming Organs:** Definition, classification, pharmacological actions, dose, indications, and contraindications of • Hematinic agents • Anti-coagulants • Anti-platelet agents • Thrombolytic drugs	**4**	

7	**Drugs Acting on the Respiratory System**: Definition, classification, pharmacological actions, dose, indications, and contraindications of • Bronchodilators • Expectorants • Anti-tussive agents • Mucolytic agents	**2**	
8	**Drugs Acting on the Gastro Intestinal Tract**: Definition, classification, pharmacological actions, dose, indications, and contraindications of • Anti-ulcer drugs • Anti-emetics • Laxatives and purgatives • Anti-diarrheal drugs	**5**	
9	**Drugs Acting on the Kidney**: Definition, classification, pharmacological actions, dose, indications, and contraindications of • Diuretics • Anti-Diuretics	**2**	
10	**Hormones and Hormone Antagonists**: Physiological and pathological role and clinical uses of: • Thyroid hormones • Anti-thyroid drugs • Parathormone • Calcitonin • Vitamin D • Insulin • Oral hypoglycemic agents • Estrogen • Progesterone • Oxytocin • Corticosteroids	**8**	
11	**Autocoids:** • Physiological role of Histamine,5-HT and Prostaglandins • Classification, clinical uses, and adverse effects of antihistamines and 5 HT antagonists	**3**	
12	***Chemotherapeutic Agents***: Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, indication and contraindications of drugs belonging to following classes: • Penicillins • Cephalosporins • Aminoglycosides • Fluoroquinolones • Macrolides • Tetracyclines • Sulphonamides • Anti-tubercular drugs • Anti-fungal drugs • Anti-viral drugs • Anti-amoebic agents • Anthelmintics • Anti-malarial agents • Anti-neoplastic agents	**12**	
13	**Biologicals**: Definition, types, and indications of biological agents with examples.	**2**	Biological agents include monoclonal antibodies also. (A brief study on monoclonal antibodies with examples.)

PHARMACOLOGY – PRACTICAL

Course Code: ER20-21P **50 Hours (2 Hours/week)**

Scope: This course provides the basic understanding about the uses, mechanisms of actions, dose dependent responses of drugs in simulated virtual animal models and experimental conditions.

Course Objectives: This course will demonstrate / provide hands-on experience in the virtual platform using appropriate software on the following
1. Study of pharmacological effects of drugs like local anesthetics, mydriatic and mitotic on rabbit eye
2. Screening the effects of various drugs acting in the central nervous system
3. Study of drug effects on isolated organs / tissues
4. Study of pyrogen testing on rabbit

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Study and report the local anesthetic, mydriatic and mitotic effects of the given drug on the rabbit eye
2. Choose appropriate animal experiment model to study the effects of the given drugs acting on the central nervous system and submit the report
3. Perform the effects of given tissues (simulated) on isolated organs / tissues and interpret the results
4. Interpret the dose dependent responses of drugs in various animal experiment models

Practicals
Introduction to the following topics pertaining to the experimental pharmacology have to be discussed and documented in the practical manuals.
1. Introduction to experimental pharmacology
2. Study of laboratory animals: (a) Mice; (b) Rats; (c) Guinea pigs; (d) Rabbits
3. Commonly used instruments in experimental pharmacology
4. Different routes of administration of drugs in animals
5. Types of pre-clinical experiments: In-Vivo, In-Vitro, Ex-Vivo, etc.
6. Techniques of blood collection from animals

Experiments
Note: Animals shall not be used for doing / demonstrating any of the experiments given. The given experiments shall be carried- out / demonstrated as the case may be, ONLY with the use of software program(s) such as ‘Ex Pharm’ or any other suitable software
1. Study of local anaesthetics on rabbit eye
2. Study of Mydriatic effect on rabbit eye
3. Study of Miotic effect on rabbit eye
4. Effect of analgesics using Analgesiometer
5. Study of analgesic activity by writhing test
6. Screening of anti-convulsant using Electro Convulsiometer
7. Screening of Muscle relaxants using Rota-Rod apparatus
8. Screening of CNS stimulants and depressants using Actophotometer
9. Study of anxiolytic activity using elevated plus maze method
10. Study of effect of drugs (any 2) on isolated heart
11. Effect of drugs on ciliary motility on frog’s buccal cavity
12. Pyrogen testing by rabbit method

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Introduction to Allergy Testing
2. Introduction to Toxicity Studies
3. Drug Facts Labels of US FDA
4. Pre-clinical studies in new drug development
5. Medicines and meals: Before or After food
6. Pre-clinical studies in new drug development
7. Drugs available as paediatric formulations
8. Drug information apps

Recommended Books (Latest Edition)

1. Satoskar,R.S. and Bhandarkar, S.D. Pharmacology and Pharmacotherapeutics
2. B. Suresh, A Text Book of Pharmacology
3. Derasari and Gandhi's Elements of Pharmacology
4. S.K. Kulkarni, Practical Pharmacology and Clinical Pharmacy
5. H.K. Sharma. Principles of Pharmacology
6. Mary J. Mycek, Lippincott Williams and Wilkins. Lippincott's illustrated Reviews: Pharmacology
7. Tripathi, K.D. Essentials of Medical Pharmacology.
8. Various Drug Information Books like British National Formulary, MIMS, CIMS, Drug Today etc., WHO, NIH Websites

COMMUNITY PHARMACY AND MANAGEMENT – THEORY

Course Code: ER20-22T **75 Hours (3 Hours/week)**

Scope: The course is designed to impart basic knowledge and skills to provide various pharmaceutical care services to patients and general practitioners in the community setup.

Course Objectives: This course will discuss the following:

1. Establishing and running a community pharmacy and its legal requirements
2. Professional aspects of handling and filling prescriptions
3. Patient counselling on diseases, prescription and or non-prescription medicines
4. Scope for performing basic health screening in community pharmacy settings

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the establishment, legal requirements, and effective administration of a community pharmacy
2. Professionally handle prescriptions and dispense medications
3. Counsel patients about the disease, prescription and or non-prescription medicines
4. Perform basic health screening on patients and interpret the reports in the community pharmacy settings

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	**Community Pharmacy Practice** – Definition, history and development of community pharmacy - International and Indian scenarios	2	
2	Professional responsibilities of community pharmacists Introduction to the concept of Good Pharmacy Practice and SOPs.	3	
3	**Prescription and prescription handling** • Definition, parts of prescriptions, legality of prescriptions, prescription handling, labelling of dispensed medications (Main label, ancillary label, pictograms), brief instructions on medication usage • Dispensing process, Good Dispensing Practices, dispensing errors and strategies to minimize them.	**7**	
4	**Communication skills** • Definition, types of communication skills • Interactions with professionals and patients • Verbal communication skills (one-to-one, over the telephone) • Written communication skills • Body language • Patient interview techniques	**6**	
5	**Patient counselling** • Definition and benefits of patient counselling • Stages of patient counselling - Introduction, counselling content, counselling process, and closing the counselling session • Barriers to effective counselling - Types and strategies to overcome the barriers • Patient counselling points for chronic diseases/disorders - Hypertension, Diabetes, Asthma, Tuberculosis, Chronic obstructive pulmonary disease, and AIDS • Patient Package Inserts - Definition, importance and benefits, Scenarios of PPI use in India and other countries • Patient Information leaflets - Definition and uses	**10**	
6	**Medication Adherence**: Definition, factors influencing non- adherence, strategies to overcome non-adherence	**2**	
7	**Health Screening Services in Community Pharmacy** Introduction, scope, and importance of various health	**5**	

	screening services - for routine monitoring of patients, early detection, and referral of undiagnosed cases		
8	**Over The Counter (OTC) Medications**: • Definition, need and role of Pharmacists in OTC medication dispensing • OTC medications in India, counseling for OTC products • Self-medication and role of pharmacists in promoting the safe practices during self-medication • Responding to symptoms, minor ailments, and advice for self-care in conditions such as - Pain management, Cough, Cold, Diarrhea, Constipation, Vomiting, Fever, Sore throat, Skin disorders, Oral health (mouth ulcers, dental pain, gum swelling)	**15**	
9	**Community Pharmacy Management**: • Legal requirements to set up a community pharmacy • Site selection requirements • Pharmacy designs and interiors • Vendor selection and ordering • Procurement, inventory control methods, and inventory management • Financial planning and management • Accountancy in community pharmacy – Day book, Cash book • Introduction to pharmacy operation software – usefulness and availability • Customer Relation Management (CRM) • Audits in Pharmacies • SOP of Pharmacy Management • Introduction to Digital Health, mHealth and Online pharmacies	**25**	

COMMUNITY PHARMACY AND MANAGEMENT – PRACTICAL

Course Code: ER20-22P **75 Hours (3 Hours/week)**

Scope: The course is designed to train the students and improve professional skills to provide various pharmaceutical care services in community pharmacy.

Course Objectives: This course will train the students in the following
1. Professional handling and filling prescriptions
2. Patient counselling on diseases and minor ailments
3. Patient counselling on prescription and / or non-prescription medicines
4. Preparation of counselling materials such as patient information leaflets
5. Performing basic health screening tests

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Handle and fill prescriptions in a professional manner
2. Counsel patients on various diseases and minor ailments
3. Counsel patients on prescription and or non-prescription medicines
4. Design and prepare patient information leaflets
5. Perform basic health screening tests

Practicals

Note: The following practicals shall be carried out in the model community pharmacy with appropriate simulated scenarios and materials. Students shall be trained through role plays wherever necessary. The activities of the students shall be assessed / evaluated using a structured objective assessment form.

1. Handling of prescriptions with professional standards, reviewing prescriptions, checking for legal compliance and completeness (minimum 5)
2. Identification of drug-drug interactions in the prescription and follow-up actions (minimum 2)
3. Preparation of dispensing labels and auxiliary labels for the prescribed medications (minimum 5)
4. Providing the following health screening services for monitoring patients / detecting new patients (one experiment for each activity)
Blood Pressure Recording, Capillary Blood Glucose Monitoring, Lung function assessment using Peak Flow Meter and incentive spirometer, recording capillary oxygen level using Pulse Oximeter, BMI measurement
5. Providing counselling to simulated patients for the following chronic diseases / disorders including education on the use of devices such as insulin pen, inhalers, spacers, nebulizers, etc. where appropriate (one experiment for each disease)
Type 2 Diabetes Mellitus, Primary Hypertension, Asthma, Hyperlipidaemia, Rheumatoid Arthritis
6. Providing counselling to simulated patients for the following minor ailments (any three)
Headache, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhoea, constipation), Worm infestations, Pyrexia, Upper Respiratory Tract infections, Skin infections, Oral and dental disorders.
7. Appropriate handling of dummy dosage forms with correct administration techniques - oral liquids with measuring cup/cap/dropper, Eye Drops, Inhalers, Nasal drops, Insulin pen, nebulizers, different types of tablets, patches, enemas, suppositories
8. Use of Community Pharmacy Software and digital health tools

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)
1. SOPs for various activities in Community Pharmacy (as discussed in Theory and Practical)
2. List out the various abbreviations, short forms used in prescriptions and their interpretation
3. Patient Information Leaflet for a given chronic disease / disorder
4. Patient Information Leaflet for prescription / non-prescription medicines
5. Preparation of window / shelf display materials for the model community pharmacy
6. Overview of Software available for retail pharmacy management including billing, inventory, etc.
7. Dosage / Medication Reminder Aids
8. Overview on the operations and marketing strategies of various online pharmacies
9. Overview on the common fixed dose combinations
10. Overview on the medications requiring special storage conditions
11. Role of Community Pharmacists in preventing Antimicrobial Resistance
12. Jan Aushadhi and other Generic Medicine initiatives in India
13. Global Overview of Online Pharmacies
14. Community Pharmacy Practice Standards: Global Vs. Indian Scenario

15. Overview of pharmacy associations in India

Field Visit

The students shall be taken in groups to visit community pharmacies and medicine distributors to understand and witness the professional activities of the community pharmacists, and supply chain logistics. Individual reports from each student on their learning experience from the field visit shall be submitted.

Recommended Books (Latest Edition)

1. Health Education and Community Pharmacy by N.S. Parmar.
2. WHO consultative group report.
3. Drug store and Business management by Mohammed Ali and Jyoti.
4. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical Press
5. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams and Wilkins.
6. Good Pharmacy Practices Training Manual by IPA/CDSCO/WHO India
7. Training Module for Community Pharmacists in TB Care and Control/ by MoH/IPA
8. Hand Book of PharmaSoS, Drugs in Special population- Pregnancy and Lactation, Tobacco free future- Choice is yours: KSPC Publications.
9. Responsible Use of Medicines: A Layman's Handbook, www.ipapharma.org /publications
10. Community Pharmacy Practice around the Globe: Part One: www.ipapharma.org /publications

BIOCHEMISTRY & CLINICAL PATHOLOGY – THEORY

Course Code: ER20-23T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge on the study of structure and functions of biomolecules and the chemical processes associated with living cells in normal and abnormal states. The course also emphasizes on the clinical pathology of blood and urine.

Course Objectives: This course will discuss the following at the fundamental level
1. Structure and functions of biomolecules
2. Catalytic activity, diagnostic and therapeutic importance of enzymes
3. Metabolic pathways of biomolecules in health and illness (metabolic disorders)
4. Biochemical principles of organ function tests and their clinical significance
5. Qualitative and quantitative determination of biomolecules / metabolites in the biological sample
6. Clinical pathology of blood and urine

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe the functions of biomolecules
2. Discuss the various functions of enzymes in the human system
3. Explain the metabolic pathways of biomolecules in both physiological and pathological conditions
4. Describe the principles of organ function tests and their clinical significances
5. Determine the biomolecules / metabolites in the given biological samples, both qualitatively and quantitatively
6. Describe the clinical pathology of blood and urine

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	**Introduction to biochemistry**: Scope of biochemistry in pharmacy; Cell and its biochemical organization.	2	
2	**Carbohydrates** • Definition, classification with examples, chemical properties • Monosaccharides - Structure of glucose, fructose, and galactose • Disaccharides - structure of maltose, lactose, and sucrose • Polysaccharides - chemical nature of starch and glycogen • Qualitative tests and biological role of carbohydrates	5	
3	**Proteins** • Definition, classification of proteins based on composition and solubility with examples • Definition, classification of amino acids based on chemical nature and nutritional requirements with examples • Structure of proteins (four levels of organization of protein structure) • Qualitative tests and biological role of proteins and amino acids • Diseases related to malnutrition of proteins.	5	
4	**Lipids** • Definition, classification with examples • Structure and properties of triglycerides (oils and fats) • Fatty acid classification – Based on chemical and nutritional requirements with examples • Structure and functions of cholesterol in the body • Lipoproteins - types, composition and functions in the body • Qualitative tests and functions of lipids	**5**	
5	**Nucleic acids** • Definition, purine and pyrimidine bases • Components of nucleosides and nucleotides with examples • Structure of DNA (Watson and Crick model), RNA and their functions	4	
6	**Enzymes**	5	

	• Definition, properties and IUB and MB classification • Factors affecting enzyme activity • Mechanism of action of enzymes, Enzyme inhibitors • Therapeutic and pharmaceutical importance of enzymes		
7	**Vitamins** • Definition and classification with examples • Sources, chemical nature, functions, coenzyme form, recommended dietary requirements, deficiency diseases of fat-and water-soluble vitamins	6	
8	**Metabolism** (Study of cycle/pathways without chemical structures) • Metabolism of Carbohydrates: Glycolysis, TCA cycle, and glycogen metabolism, regulation of blood glucose. Diseases related to abnormal metabolism of carbohydrates. • Metabolism of lipids: Lipolysis, β-oxidation of Fatty acid (Palmitic acid), ketogenesis and ketolysis. Diseases related to abnormal metabolism of lipids such as Ketoacidosis, Fatty Liver, Hypercholesterolemia. • Metabolism of Amino acids (Proteins): General reactions of amino acids and its significance– Transamination, deamination, Urea cycle and Decarboxylation. Diseases related to abnormal metabolism of amino acids, Disorders of ammonia metabolism, phenylketonuria, alkaptonuria, and Jaundice. • Biological oxidation: Electron transport chain and Oxidative phosphorylation	20	(β-oxidation of Fatty acid with reference to Palmitic acid),
9	**Minerals**: Types, Functions, Deficiency diseases, recommended dietary requirements	5	
10	**Water and Electrolytes** • Distribution, functions of water in the body • Water turnover and balance • Electrolyte composition of the body fluids, Dietary intake of electrolyte and Electrolyte balance • Dehydration, causes of dehydration and oral rehydration therapy	5	
11	Introduction to Biotechnology	1	Include a brief study on • Basic principles of genetic engineering • Recombinant DNA technology and its application
12	**Organ function tests** • Functions of kidney and routinely performed	6	

	tests to assess the functions of kidney and their clinical significances. • Functions of liver and routinely performed tests to assess the functions of liver and their clinical significances. • Lipid profile tests and its clinical significances.		
13	**Introduction to Pathology of Blood and Urine** • Lymphocytes and Platelets, their role in health and disease • Erythrocytes - Abnormal cells and their significance • Normal and Abnormal constituents of Urine and their significance	**6**	

BIOCHEMISTRY & CLINICAL PATHOLOGY – PRACTICAL

Course Code: ER20-23P **50 Hours (2 Hours/week)**

Scope: This course is designed to train the students in the qualitative testing of various biomolecules and testing of biological samples for determination of normal and abnormal constituents

Course Objectives: This course will train and provide hands-on experiences on the following
1. Qualitative determination of biomolecules / metabolites in simulated biological samples
2. Determination of normal and abnormal constituents of simulated blood and urine samples

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Qualitatively determine the biomolecules / metabolites in the given biological samples
2. Determine the normal and abnormal constituents in blood and urine samples and interpret the results of such testing

Practicals
1. Qualitative analysis of carbohydrates (4 experiments)
   (Carbohydrates – glucose, fructose, sucrose, lactose)
2. Qualitative analysis of Proteins and amino acids (4 experiments)
   (Proteins – albumin, casein, gelatine, peptone)
3. Qualitative analysis of lipids (2 experiments)
   (Lipids- triglycerides, cholesterol)
4. Qualitative analysis of urine for normal and abnormal constituents
   (4 experiments)
   Normal constituents – inorganic/organic
   Abnormal constituents – sugar, protein, bile pigment, bile salts, ketone bodies
5. Determination of constituents of urine (glucose, creatinine, chlorides) (any 2 experiments)
6. Determination of constituents of blood/serum (simulated) (Creatine, glucose, cholesterol, Calcium, Urea, SGOT/SGPT) (any 5 experiments)
7. Study the hydrolysis of starch from acid and salivary amylase enzyme (1 experiment)

Assignments
The students shall be asked to submit written assignments on various Pathology Lab Reports (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

Recommended Books (Latest Edition)

1. Essentials of Biochemistry by U. Satyanarayana, Books and Allied (P) Ltd.
2. A Textbook of Biochemistry by A.V.S.S. Rama Rao, UBS Publishers Distributors Pvt. Ltd.
3. Practical Biochemistry by R.C. Gupta and S. Bhargava.
4. Laboratory manual of Biochemistry by Pattabiraman and Sitaram Acharya

PHARMACOTHERAPEUTICS – THEORY

Course Code: ER20-24T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge on etiopathogenesis of common diseases and their management along with quality use of medicines.

Course Objectives: This course will discuss about
1. Etiopathogenesis of selectedcommon diseases and evidence-based medicine therapy
2. Importance of individualized therapeutic plans based on diagnosis
3. Basic methods for assessing the clinical outcomes of drug therapy

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Help assessing the subjective and objective parameters of patients in common disease conditions
2. Assist other healthcare providers to analyse drug related problems and provide therapeutic interventions
3. Participate in planning the rational medicine therapy for common diseases
4. Design and deliver discharge counselling for patients

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	Pharmacotherapeutics – Introduction, scope, and objectives. Rational use of Medicines, Evidence Based Medicine, Essential Medicines List, Standard Treatment Guidelines (STGs)	8	
2	**Definition, etiopathogenesis, clinical manifestations, non- pharmacological and pharmacological management of the diseases associated with**:		
	(a) **Cardiovascular System** • Hypertension • Angina and Myocardial infarction • Hyperlipidemia • Congestive Heart Failure	**8**	
	(b) **Respiratory System** • Asthma • COPD	**4**	
	(c) **Endocrine System** • Diabetes • Thyroid disorders - Hypo and Hyperthyroidism	**5**	
	(d) **Central Nervous System** • Epilepsy • Parkinson's disease • Alzheimer's disease • Stroke • Migraine	**8**	
	(e) **Gastro Intestinal Disorders** • Gastro oesophageal reflux disease • Peptic	**8**	

	Ulcer Disease • Alcoholic liver disease • Inflammatory Bowel Diseases (Crohn's Disease and Ulcerative Colitis)		
	(f) **Haematological disorders** • Iron deficiency anaemia • Megaloblastic anaemia	**4**	
	(g) **Infectious diseases** • Tuberculosis • Pneumonia • Urinary tract infections • Hepatitis • Gonorrhoea and Syphilis • Malaria • HIV and Opportunistic infections • Viral Infections (SARS, CoV2)	**12**	
	(h) **Musculoskeletal disorders** • Rheumatoid arthritis • Osteoarthritis	**3**	
	(i) **Dermatology** • Psoriasis • Scabies • Eczema	**3**	
	j) **Psychiatric Disorders** • Depression • Anxiety • Psychosis	**4**	
	(k) **Ophthalmology** • Conjunctivitis (bacterial and viral) • Glaucoma	**2**	
	(l) **Anti-microbial Resistance**	**2**	Include Definition, causes, types and problems of antimicrobial resistance. Measures to decrease antibiotic resistance and role of Pharmacists in it.
	(m) **Women's Health** • Polycystic Ovary Syndrome • Dysmenorrhea • Premenstrual Syndrome	**4**	

PHARMACOTHERAPEUTICS – PRACTICAL

Course Code: ER20-24P **25 Hours (1 Hour/week)**

Scope: This course is designed to train the students in the basic skills required to support the pharmaceutical care services for selected common disease conditions.

Course Objectives: This course will train the students on
1. How to prepare a SOAP (Subjective, Objective, Assessment and Plan) note for clinical cases of selected common diseases
2. Patient counselling techniques/methods for common disease conditions

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Write SOAP (Subjective, Objective, Assessment and Plan) notes for the given clinical cases of selected common diseases
2. Counsel the patients about the disease conditions, uses of drugs, methods of handling and administration of drugs, life-style modifications, and monitoring parameters.

Practicals

I. Preparation and discussion of SOAP (Subjective, Objective, Assessment and Plan) notes for at least SIX clinical cases (real / hypothetical) of the following disease conditions.
1. Hypertension
2. Angina Pectoris
3. Myocardial Infarction
4. Hyperlipidemia
5. Rheumatoid arthritis
6. Asthma
7. COPD
8. Diabetes
9. Epilepsy
10. Stroke
11. Depression
12. Tuberculosis
13. Anaemia (any one type as covered in theory)
14. Viral infection (any one type as covered in theory)
15. Dermatological conditions (any one condition as covered in theory)

II. Patient counselling exercises using role plays based on the real / hypothetical clinical case scenarios. The students are expected to provide counselling on disease condition, medications, life-style modifications, monitoring parameters, etc. and the same shall be documented. (Minimum 5 cases)

III. Simulated cases to enable dose calculation of selected drugs in paediatrics, and geriatrics under various pathological conditions. (Minimum 4 cases)

Recommended Books (Latest Edition)
1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone Publication
2. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
3. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA Lippincott, Williams and Wilkins Publication.
4. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton and Lange Publication.
5. National Formulary of India, Indian Pharmacopoeia Commission, Ghaziabad.

HOSPITAL AND CLINICAL PHARMACY – THEORY

Course Code: ER20-25T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart fundamental knowledge and professional skills required for facilitating various hospital and clinical pharmacy services.

Course Objectives: This course will discuss and train the students in the following
1. Hospital and Hospital Pharmacy organization and set-ups
2. Basics of hospital pharmacy services including the procurement, supply chain, storage of medicines and medical supplies
3. Basics of clinical pharmacy including introduction to comprehensive pharmaceutical care services
4. Basic interpretations of common laboratory results used in clinical diagnosis towards optimizing the drug therapy

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Explain about the basic concepts of hospital pharmacy administration
2. Manage the supply chain and distribution of medicines within the hospital settings
3. Assist the other healthcare providers in monitoring drug therapy and address drug related problems
4. Interpret common lab investigation reports for optimizing drug therapy

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	**Hospital Pharmacy** • Definition, scope, national and international scenario • Organisational structure • Professional responsibilities, Qualification and experience requirements, job specifications, work load requirements and inter-professional relationships • Good Pharmacy Practice (GPP) in hospital • Hospital Pharmacy Standards (FIP Basel Statements, AHSP) • Introduction to NAQS guidelines and NABH Accreditation and Role of Pharmacists	**6**	
2	**Different Committees in the Hospital** • Pharmacy and Therapeutics Committee - Objectives, Composition, and functions • Hospital Formulary-Definition, procedure for development and use of hospital formulary • Infection Control Committee – Role of Pharmacist in preventing Antimicrobial Resistance	**4**	
3	**Supply Chain and Inventory Control** • Preparation of Drug lists - High Risk drugs, Emergency drugs, Schedule H1 drugs, NDPS drugs, reserved antibiotics • Procedures of Drug Purchases – Drug selection, short term, long term, and tender/e-tender process, quotations, etc. • Inventory control techniques: Economic Order Quantity, Reorder Quantity Level, Inventory Turnover etc. • Inventory Management of Central Drug Store – Storage conditions, Methods of storage, Distribution, Maintaining Cold Chain, Devices	**14**	

	used for cold storage (Refrigerator, ILR, Walk-in-Cold rooms) • FEFO, FIFO methods • Expiry drug removal and handling, and disposal. Disposal of Narcotics, cytotoxic drugs • Documentation - purchase and inventory		
4	**Drug distribution** • Drug distribution (in- patients and out - patients) – Definition, advantages and disadvantages of individual prescription order method, Floor Stock Method, Unit Dose Drug Distribution Method, Drug Basket Method. • Distribution of drugs to ICCU/ICU/NICU/Emergency wards. • Automated drug dispensing systems and devices • Distribution of Narcotic and Psychotropic substances and their storage	**7**	
5	Compounding in Hospitals. Bulk compounding, IV admixture services and incompatibilities, Total parenteral nutrition	**4**	
6	**Radio Pharmaceuticals** - Storage, dispensing and disposal of Radiopharmaceuticals	**2**	
7	Application of computers in Hospital Pharmacy Practice. Electronic health records, Softwares used in hospital pharmacy	**2**	
8	**Clinical Pharmacy**: Definition, scope, and development - in India and other countries Technical definitions, common terminologies used in clinical settings and their significance such as Paediatrics, Geriatric, Anti-natal Care, Post-natal Care, etc. **Daily activities of clinical pharmacists**: Definition, goal, and procedure of • Ward round participation • Treatment Chart Review • Adverse drug reaction monitoring • Drug information and poisons information • Medication history • Patient counselling • Interprofessional collaboration **Pharmaceutical care**: Definition, classification of drug related problems. Principles and procedure to provide pharmaceutical care **Medication Therapy Management, Home Medication Review**	**12**	
9	**Clinical laboratory tests** used in the evaluation of disease states - significance and interpretation of	**10**	

	test results • Haematological, Liver function, Renal function, thyroid function tests • Tests associated with cardiac disorders • Fluid and electrolyte balance • Pulmonary Function Tests		
10	**Poisoning:** Types of poisoning: Clinical manifestations and Antidotes **Drugs and Poison Information Centre and their services** – Definition, Requirements, Information resources with examples, and their advantages and disadvantages	**6**	
11	**Pharmacovigilance** • Definition, aim and scope • Overview of Pharmacovigilance	**2**	
12	**Medication errors**: Definition, types, consequences, and strategies to minimize medication errors, LASA drugs and Tallman lettering as per ISMP **Drug Interactions**: Definition, types, clinical significance of drug interactions	**6**	

HOSPITAL AND CLINICAL PHARMACY – PRACTICAL

Course Code: ER20-25P **25 Hours (1 Hour/week)**

Scope: This course is designed to train the students to assist other healthcare providers in the basic services of hospital and clinical pharmacy.

Course Objectives: This course will train the students with hands-on experiences, simulated clinical case studies in the following:
1. Methods to systematically approach and respond to drug information queries
2. How to interpret common laboratory reports to understand the need for optimizing dosage regimens
3. How to report suspected adverse drug reactions to the concerned authorities
4. Uses and methods of handling various medical/surgical aids and devices
5. How to interpret drug-drug interactions in the treatment of common diseases.

Course Outcomes: Upon completion of the course, the students will be able to
1. Professionally handle and answer the drug information queries
2. Interpret the common laboratory reports
3. Report suspected adverse drug reactions using standard procedures
4. Understand the uses and methods of handling various medical/surgical aids and devices
5. Interpret and report the drug-drug interactions in common diseases for optimizing the drug therapy

Note: Few of the experiments of Hospital and Clinical Pharmacy practical course listed here require adequate numbers of desktop computers with internet connectivity, adequate drug information resources including reference books, different types of surgical dressings and other medical devices and accessories. Various charts, models, exhibits pertaining to the experiments shall also be displayed in the laboratory.

Practicals

1. Systematic approach to drug information queries using primary / secondary / tertiary resources of information (2 cases)
2. Interpretation of laboratory reports to optimize the drug therapy in a given clinical case (2 cases)
3. Filling up IPC's ADR Reporting Form and perform causality assessments using various scales (2 cases)
4. Demonstration / simulated / hands-on experience on the identification, types, use / application /administration of
    - Orthopaedic and Surgical Aids such as knee cap, LS belts, abdominal belt, walker, walking sticks, etc.
    - Different types of bandages such as sterile gauze, cotton, crepe bandages, etc.
    - Needles, syringes, catheters, IV set, urine bag, RYLE's tube, urine pots, colostomy bags, oxygen masks, etc.
5. Case studies on drug-drug interactions (any 2 cases)
6. Wound dressing (simulated cases and role play –minimum 2 cases)
7. Vaccination and injection techniques (IV, IM, SC) using mannequins (5 activities)
8. Use of Hospital Pharmacy Software and various digital health tools

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Typical profile of a drug to be included in the hospital formulary
2. Brief layout and various services of the Central Sterile Supplies Department (CSSD)
3. Various types of sterilizers and sterilization techniques used in hospitals
4. Fumigation and pesticide control in hospitals
5. Role of Pharmacists in Transition of Care: Discharge cards, post hospitalization care, medicine reconciliation activities in developed countries
6. Total parenteral nutrition and IV admixtures and their compatibility issues
7. Concept of electronic health records
8. Invasive and Non-invasive diagnostic tests - HRCT, MRI, Sonography, 2D ECHO, X-rays, Mammography, ECG, EMG, EEG
9. Home Diagnostic Kits - Pregnancy Test, COVID testing etc
10. Measures to be taken in hospitals to minimize Antimicrobial Resistance
11. Role and responsibilities of a pharmacist in public hospital in rural parts of the country
12. Safe waste disposal of hospital waste

Field Visit

The students shall be taken in groups to visit a Government / private healthcare facility to understand and witness the various hospital and clinical pharmacy services provided. Individual reports from each student on their learning experience from the field visit shall be submitted.

Recommended Books (Latest Edition)

1. A Textbook of Clinical Pharmacy Practice - Essential concepts and skills - Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata. Orient Longman Pvt. Ltd. Hyderabad.
2. Text Book of Hospital and Clinical Pharmacy by Dr. Pratibha Nand and Dr. Roop K Khar, Birla publications, New Delhi.
3. Gupta B.K and Gupta R.N., GPP in Hospital Pharmacy, Vallabh Prakashan.
4. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
5. Australian drug information- Procedure manual. The Society of Hospital Pharmacists of Australia.

PHARMACY LAW AND ETHICS – THEORY

Course Code: ER20-26T **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India

Course Objectives: This course will discuss the following
1. General perspectives, history, evolution of pharmacy law in India
2. Act and Rules regulating the profession and practice of pharmacy in India
3. Important code of ethical guidelines pertaining to various practice standards
4. Brief introduction to the patent laws and their applications in pharmacy

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe the history and evolution of pharmacy law in India
2. Interpret the act and rules regulating the profession and practice of pharmacy in India
3. Discuss the various codes of ethics related to practice standards in pharmacy
4. Interpret the fundamentals of patent laws from the perspectives of pharmacy

I	II	III	IV
Chapter	Topics (PCI)	Hrs	Clarifications
1	General Principles of Law, History and various Acts related to Drugs and Pharmacy profession	**2**	
2	**Pharmacy Act-1948 and Rules**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils, Registration of Pharmacists, Offences and Penalties. **Pharmacy Practice Regulations 2015**	**5**	
3	**Drugs and Cosmetics Act 1940 and Rules 1945 and New Amendments** Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. **Manufacture of drugs** – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license. Study of schedule C and C1, G, H, H1, K, P, M, N, and X. **Sale of Drugs** – Wholesale, Retail sale and Restricted license, Records to be kept in a pharmacy Drugs Prohibited for manufacture and sale in India	**23**	

	Administration of the Act and Rules – Drugs Technical Advisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, licensing authorities, controlling authorities, Drug Inspectors.		
4	**Narcotic Drugs and Psychotropic Substances Act 1985** and Rules Objectives, Definitions, Authorities and Officers, Prohibition, Control and Regulation, Offences and Penalties.	**2**	
5	**Drugs and Magic Remedies (Objectionable Advertisements) Act 1954**: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.	**2**	
6	**Prevention of Cruelty to Animals Act-1960**: Objectives, Definitions, CPCSEA - brief overview, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and Acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.	**2**	
7	**Poisons Act-1919:** Introduction, objective, definition, possession, possession for sales and sale of any poison, import of poisons	**2**	
8	**FSSAI (Food Safety and Standards Authority of India)** Act and Rules: brief overview and aspects related to manufacture, storage, sale, and labelling of Food Supplements	**2**	
9	**National Pharmaceutical Pricing Authority**: Drugs Price Control Order (DPCO) - 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, Pharmaceutical Policy 2002, National List of Essential Medicines (NLEM)	**5**	
10	**Code of Pharmaceutical Ethics:** Definition, ethical principles, ethical problem solving, registration, code of ethics for Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath.	**5**	
11	Medical Termination of Pregnancy Act and Rules – basic understanding, salient features, and Amendments	**2**	
12	Role of all the government pharma regulator bodies – Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission (IPC)	**1**	
13	Good Regulatory practices (documentation, licenses, renewals, e-governance) in Community Pharmacy, Hospital pharmacy, Pharma Manufacturing, Wholesale business, inspections, import, export of drugs and medical devices	**3**	
14	Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, New Drugs and Clinical Trials Rules, 2019. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency Use Authorization	**7**	

15	Blood bank – basic requirements and functions	**2**	
16	Clinical Establishment Act and Rules – Aspects related to Pharmacy	**2**	
17	Biomedical Waste Management Rules 2016 – Basic aspects, and aspects related to pharma manufacture to disposal of pharma / medical waste at homes, pharmacies and hospitals	**2**	
18	Bioethics - Basic concepts, history and principles. Brief overview of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human participants	**2**	
19	Introduction to the Consumer Protection Act	**1**	
20	Introduction to the Disaster Management Act	**1**	
21	Medical Devices – Categorization, basic aspects related to manufacture and sale	**2**	

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Requirements for Ayurvedic, Homeopathic manufacturing, sale, and licensing requirements
2. Layout and contents of official websites of various agencies regulating the profession of pharmacy in India: e.g., CDSCO, SUGAM portal, PCI, etc.
3. Licenses required, application processes (online/offline), drug regulatory office website of the respective state
4. Case studies – actions taken on violation of any act / rule related to pharmacy
5. Schedule H1 drugs and its implementation in India
6. Counterfeit / Spurious medicines
7. Drug Testing Labs in India
8. Overview of Pharma marketing practices
9. Generic Medicines

Recommended Books (Latest Edition)

1. Text book of Forensic Pharmacy by B.M. Mithal
2. Forensic Pharmacy by B. Suresh
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations Act 1955 by Govt. of India publications.
7. Narcotic Drugs and Psychotropic Substances Act by Govt. of India publications
8. Drugs and Magic Remedies Act by Govt. of India publications.
9. CDSCO Website, NPPA Website
10. Books on Drugs and Cosmetic Act by Nilesh Gandhi and Sudhir Deshpande
11. Text Book of Forensic Pharmacy by Dr Guruprasad Mohanta

c. Scheme for Regular Practical Classes

PHARMACOLOGY

(Experiments have to be carried out using suitable software)

Major Experiments

1. Effect of analgesics using Analgesiometer
2. Study of analgesic activity by writhing test
3. Screening of anti-convulsant using Electro Convulsiometer
4. Screening of Muscle relaxants using Rota-Rod apparatus
5. Screening of CNS stimulants and depressants using Actophotometer
6. Study of anxiolytic activity using elevated plus maze method
7. Pyrogen testing by rabbit method

Minor Experiments

1. Introduction to experimental pharmacology
2. Study of laboratory animals (a) Mice; (b) Rats; (c) Guinea pigs; (d) Rabbits, including routes of administration of drugs and techniques of blood collection from them (using audio-visual aids)
3. Commonly used instruments in experimental pharmacology
5. Introduction to different types of pre-clinical experiments: In-Vivo, In-Vitro, Ex-Vivo, etc.
6. Study of local anaesthetics on rabbit eye
7. Study of Mydriatic effect on rabbit eye
8. Study of Miotic effect on rabbit eye
9. Study of effect of drugs (any 2) on isolated heart
10. Effect of drugs on ciliary motility on frog's buccal cavity

COMMUNITY PHARMACY AND MANAGEMENT

Major experiments

1. Conducting of role plays on professional handling and filling of prescriptions (prescription reading, checking for legal compliance, filling of prescription, labeling, billing and dispensing with counseling -minimum 5)

2. Conducting of role plays on counselling to simulated patients for the following chronic diseases / disorders including education on the use of devices such as insulin pen, inhalers, spacers, nebulizers, etc. where appropriate (one experiment for each disease)
   - Type 2 Diabetes Mellitus,
   - Primary Hypertension,
   - Asthma,
   - Hyperlipidaemia,
   - Rheumatoid Arthritis
3. Conducting of role plays on counselling to simulated patients for the following minor ailments (any three)

Headache, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhoea, constipation), Worm infestations, Pyrexia, Upper Respiratory Tract infections, Skin infections, Oral and dental disorders.

Minor Experiments

1. Perform the following health screening tests
    - Blood Pressure Recording
    - Capillary Blood Glucose Monitoring
    - Lung function assessment using Peak Flow Meter and incentive spirometer
    - Recording of capillary oxygen level using Pulse Oximeter
    - Measurement of BMI

2. Identification of drug-drug interactions in the prescription and remedial measures (minimum 2)
3. Preparation of dispensing labels and auxiliary labels for the prescribed medications (minimum 5)
4. Hands on experience on handling and administration techniques for different dummy dosage forms - Oral liquids with measuring cup/cap/dropper, Eye Drops, Inhalers, spacers, nebulizers, Nasal drops, Insulin pen, different types of tablets, patches, enemas, suppositories.
5. Familiarizing with the use of different community pharmacy software and digital health tools

BIOCHEMISTRTY

Major Experiments

I. Quantitative estimation of the following biochemical constituents from the simulated sample of blood/ serum using photo colorimetric or by titrimetric analysis.
Creatinine, glucose, cholesterol, calcium, urea, SGOT, SGPT
II. Quantitative estimation of the following biochemical constituents from the simulated sample of urine using photo colorimetric or by titrimetric analysis
Chloride, creatinine, glucose
III. Evaluation of starch hydrolysis by acid / salivary amylase.

Minor Experiments

1. Qualitative analysis of carbohydrates (glucose, fructose, sucrose, lactose)
2. Qualitative analysis of Proteins and amino acids (albumin, casein, gelatine, peptone)
3. Qualitative analysis of lipids (triglycerides, cholesterol)
4. Qualitative analysis of urine for normal constituents
5. Qualitative analysis of urine for abnormal constituents (sugar, protein, bile pigment, bile salts, ketone bodies)

PHARMACOTHERAPEUTICS

Major Experiments

Prepare and discuss SOAP notes for minimum SIX clinical cases (real / hypothetical) from the following disease conditions

1. Hypertension
2. Angina Pectoris
3. Myocardial Infarction
4. Hyperlipidemia
5. Rheumatoid arthritis
6. Asthma
7. COPD
8. Diabetes
9. Epilepsy
10. Stroke
11. Depression
12. Tuberculosis
13. Anaemia (any one type)
14. Viral infection (any one type)
15. Dermatological conditions (any one condition)

Minor Experiments

I. Conduct role plays of patient counselling with proper documentation for the following (Minimum five role plays)
   - Proper usage & storage of different medications and dosage forms
   - Monitoring of parameters like blood sugar, body temperature, pulse rate, oxygen level (Pulse oximeter)
   - Giving awareness including the necessary life style modifications to those with chronic conditions such as diabetes, hypertension, epilepsy, angina.

II. Carry out the dose calculation of drugs for paediatric, and geriatrics under various pathological conditions (minimum four)

HOSPITAL AND CLINICAL PHARMACY

Major Experiments

1. Preparation & documentation of answers to the drug information queries (real/hypothetical) following the systematic approach. (using primary / secondary / tertiary resources of information)- 2 cases

2. Interpretation of different laboratory reports and optimize the drug therapy in a given clinical case. (Clinical laboratory tests such as haematological, liver function, renal function, thyroid

function or pulmonary function tests, tests associated with cardiac disorders, fluid and electrolyte balance) -2cases.

3. Filling of ADR reporting forms (PCI) and carry out the causality assessments using various scales for the given ADR (2 cases)

Minor Experiments

1. Demonstration / simulated / hands-on experience on the identification, types, use / application /administration of
   • Orthopaedic and Surgical Aids such as knee cap, LS belts, abdominal belt, walker, walking sticks, etc.
   • Different types of bandages such as sterile gauze, cotton, crepe bandages, etc.
   • Needles, syringes, catheters, IV set, urine bag, RYLE's tube, urine pots, colostomy bags, oxygen masks, etc.
2. Identification of the possible drug-drug interactions in different prescriptions and the suggestion of remedial measures (2 cases)
3. Conducting role plays of wound dressing using simulated cases. (2 cases)
4. Demonstration of different vaccination and injection techniques (IV, IM, SC) using suitable mannequins
5. Demonstrate/ illustrate the working of different software used in hospital pharmacies / various digital health tools.

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