S.	Course	Name of the Course	Total	Hours per
No.	Code		Hours	Week
1.	ER20-21T	Pharmacology – Theory	75	3
2.	ER20-21P	Pharmacology – Practical	50	2
3.	ER20-22T	Community Pharmacy & Management – Theory	75	3
4.	ER20-22P	Community Pharmacy & Management – Practical	75	3
5.	ER20-23T	Biochemistry & Clinical Pathology – Theory	75	3
6.	ER20-23P	Biochemistry & Clinical Pathology – Practical	50	2
7.	ER20-24T	Pharmacotherapeutics – Theory	75	3
8.	ER20-24P	Pharmacotherapeutics – Practical	25	1
9.	ER20-25T	Hospital & Clinical Pharmacy – Theory	75	3
10.	ER20-25P	Hospital & Clinical Pharmacy – Practical	25	1
11.	ER20-26T	Pharmacy Law & Ethics	75	3

8. ER-2020 DPharm Syllabus – Part II

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, 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 pharmacodynamics2.

- 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

Chapter	Торіс	Hours
1	General Pharmacology	10
	 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 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	11
	 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)	
3	Drugs Acting on the Eye	2
	Definition, classification, pharmacological actions, dose,	
	Indications and contraindications of	
	Mydriatics Drugs used in Clausering	
4	Drugs used in Glaucoma	0
4	Definition classification pharmacological actions does	ð
	indications and contraindications of	
	General anaesthetics	
	Hyphotics and sedatives	
	Anti-Convulsant drugs	
	Anti-anxiety drugs	
	Anti-depressant drugs	
	Anti-psychotics	
	Nootropic agents	
	Centrally acting muscle relaxants	
	Opioid analgesics	
5	Drugs Acting on the Cardiovascular System	6
	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	
6	Drugs Acting on Blood and Blood Forming Organs	4

	Definition, classification, pharmacological actions, dose,	
	indications and contraindications of	
	Hematinic agents	
	Anti-coagulants	
	Anti-platelet agents	
	Thrombolytic drugs	
7	Definition, classification, pharmacological actions, dose,	2
	indications and contraindications of	
	 Bronchodilators 	
	Expectorants	
	Anti-tussive agents	
	Mucolytic agents	
8	Drugs Acting on the Gastro Intestinal Tract	5
	Definition, classification, pharmacological actions, dose,	
	indications and contraindications of	
	Anti-ulcer drugs	
	Anti-emetics	
	 Laxatives and purgatives 	
	Anti-diarrheal drugs	
9	Drugs Acting on the Kidney	2
	Definition, classification, pharmacological actions, dose,	
	indications, and contraindications of	
	Diuretics	
	Anti-Diuretics	
10	Hormones and Hormone Antagonists	8
	Physiological and pathological role and clinical uses of	
	I hyroid hormones	
	Anti-thyroid drugs	
	Parathormone	
	Vitamin D	
	Insulin	
	Oral hypoglycemic agents	
	Estrogen	
	Progesterone	
	Oxytocin	
	Corticosteroids	
11	Autocoids	3
	Physiological role of Histamine, 5 HT and	
	Prostaglandins	
	Classification, clinical uses and adverse effects of	
	antihistamines and 5 HT antagonists	

12	Chemotherapeutic Agents: Introduction, basic principles	12
	of chemotherapy of infections, infestations and neoplastic	
	diseases, Classification, dose, indication and	
	contraindications of drugs belonging to	
	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	
13	Biologicals	2
	Definition, types and indications of biological agents 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 anaesthetics, 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

- 1. Study and report the local anaesthetic, 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).

- 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. Newer techniques in experimental pharmacology

- 2. Introduction to High Throughput screening
- 3. Introduction to ELISA test
- 4. Intro to Allergy Testing
- 5. Intro to Toxicity Studies
- 6. Drugs available as paediatric formulations
- 7. Drug Facts Labels of USFDA
- 8. Antimicrobial Resistance
- 9. Introduction to Bioassays
- 10.Pre-clinical studies in new drug development

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 drugs
- 4. Scope for performing basic health screening in community pharmacy settings

- 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 drugs
- 4. Perform basic health screening on patients and interpret the reports in the community pharmacy settings

Chapter	Торіс	Hours
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	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 	6

	 Verbal communication skills (one-to-one, over the 	
	telephone)	
	Written communication skills	
	Body language	
	Patient interview techniques	
5	Patient counselling	10
	Definition and benefits of patient counselling	
	 Stages of patient counselling - Introduction, counselling content, counselling process and closing the counselling session 	
	 Barriers to effective counseling - 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	
6	Medication Adherence	2
	Definition, factors influencing non adherence, strategies to overcome non-adherence	
7	Health Screening Services in Community Pharmacy	_
•		5
•	Introduction, scope and importance of various health screening	5
•	Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and	5
	Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases	5
9	Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases Over The Counter (OTC) Medications	5
9	Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases Over The Counter (OTC) Medications • Definition, need and role of Pharmacists in OTC medication	5 15
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases Over The Counter (OTC) Medications Definition, need and role of Pharmacists in OTC medication dispensing OTC medications in India, acupacing for OTC products 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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 	5 15
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9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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, 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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, 	5 15
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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, 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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) 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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) Community Pharmacy Management 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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) Community Pharmacy Management Legal requirements to set up a community pharmacy 	5 15 25
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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) Community Pharmacy Management Legal requirements to set up a community pharmacy Site selection requirements 	5
9	 Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection and referral of undiagnosed cases 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) Community Pharmacy Management Legal requirements to set up a community pharmacy Site selection requirements Pharmacy designs and interiors 	5

• Procurement, inventory control methods, and inventory	
management	
Financial planning and management	
 Accountancy in community pharmacy – Day book, Cash 	
book	
 Introduction to pharmacy operation softwares – 	
usefulness and availability	
Customer Relation Management (CRM)	
Audits in Pharmacies	
SOP of Pharmacy Management	
 Introduction to Digital Health, mHealth and Online 	
pharmacies	

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 the simulated 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 drugs
- 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 drugs
- 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)
- 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

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 drugs
- 5. Preparation of window / shelf display materials for the model community pharmacy
- 6. 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 require special storage conditions
- 11. Roles of Community Pharmacists in preventing Antimicrobial Resistance
- 12. Jan Aushadhi and other Generic Medicine initiatives in India
- 13. Overview of various professional associations of Pharmacy / Pharmacists in India
- 14. Community Pharmacy Practice Standards: Global Vs. Indian Scenario
- 15. Overview on Pharma Marketing

Field Visit

The students shall be taken in groups to visit community pharmacies (both retail and wholesale) to understand and witness the professional activities of the community pharmacists. Individual reports from each student on their learning experience from the field visit shall be submitted.

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

- 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

try: Scope of biochemistry in 2
emical organization.
5 on with examples, chemical ucture of glucose, fructose and ture of maltose, lactose and

	glycogen	
	Qualitative tests and biological role of carbohydrates	
3	Proteins	5
	• 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.	
4	Lipids	5
	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	Nucleic acids	4
	Definition, purine and pyrimidine bases	
	 Components of nucleosides and nucleotides with 	
	examples	
	 Structure of DNA (watson and Crick model), RNA and their functions 	
6		E
O	Definition properties and UIP and MP elassification	5
	Eastors affecting onzyme activity	
	 Mochanism of action of onzymos. Enzyma inhibitors 	
	• Therapoutic and pharmacoutical importance of	
	• merapeutic and pharmaceutical importance of enzymes	
7	Vitamins	6
	Definition and classification with examples	U U
	Sources, chemical nature functions, coenzyme form	
	recommended dietary requirements deficiency	
	diseases of fat-and water-soluble vitamins	
8	Metabolism (Study of cycle/pathways without chemical	20
	structures)	

	Metabolism of Carbohydrates: Glycolysis, TCA cycle	
	and glycogen metabolism, regulation of blood glucose	
	level. 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, phenvlketonuria, alkaptonuria and	
	Jaundice.	
	Biological oxidation: Electron transport chain	
	and Oxidative phosphorylation	
9	Minerals: Functions, Deficiency diseases, recommended	05
	dietary requirements of calcium, phosphorus, iron, sodium	
	and chloride	
10	Water and Electrolytes	05
	 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	
11	Introduction to Biotechnology	01
12	Organ function tests	06
	Functions of kidney and routinely performed 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	06
	Lymphocytes and Platelets, their role in health and	
	disease	
	Erythrocytes - Abnormal cells and their significance	
	Normal and Abnormal constituents of Urine and their	
	significance	

BIOCHEMISTRY & CLINICAL PATHOLOGY – PRACTICAL

Course Code: ER20-23P

75 Hours (3 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)
- 2. Qualitative analysis of Proteins and amino acids (4 experiments)
- 3. Qualitative analysis of lipids (2 experiments)
- 4. Qualitative analysis of urine for normal and abnormal constituents (4 experiments)
- Determination of constituents of urine (glucose, creatinine, chlorides) (2 experiments)
- 6. Determination of constituents of blood/serum (simulated) (Creatine, glucose, cholesterol, Calcium, Urea, SGOT/SGPT) (5 experiments)
- 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)

PHARMACOTHERAPEUTICS - THEORY

Course Code: ER20-24T 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 selected common 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

Chapter	Торіс	Hours
1	Pharmacotherapeutics – Introduction, scope and objectives.	10
	Rational use of Medicines, Evidence Based Medicine,	
	Essential Medicines List, Standard Treatment Guidelines	
	(STGs)	
2	Definition, etiopathogenesis, clinical manifestations,	non-
	pharmacological and pharmacological management	of the
	diseases associated with	
	(a) Cardiovascular System	
	Hypertension	8
	 Angina and Myocardial infarction 	
	Hyperlipidaemia	
	Congestive Heart Failure	
	(b) Respiratory System	4
	Asthma	
	• COPD	
	(c) Endocrine System	5
	Diabetes	
	Thyroid disorders- Hypo and Hyperthyroidism	

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(d) Central Nervous System	8
Epilepsy	
Parkinson's disease	
Alzheimer's disease	
Stroke	
Migraine	
(e) Gastro Intestinal Disorders	8
 Gastro oesophageal reflux disease 	
Peptic Ulcer Disease	
Alcoholic liver disease	
 Inflammatory Bowel Diseases (Crohn's Disease and 	
Ulcerative Colitis)	
(f) Haematological disorders	4
 Iron deficiency anaemia 	
 Megaloblastic anaemia 	
(g) Infectious diseases	12
Tuberculosis	
Pneumonia	
Urinary tract infections	
Hepatitis	
 Gonorrhoea and Syphilis 	
Malaria	
 HIV and Opportunistic infections 	
 Viral Infections (SARS, CoV2) 	
(h) Musculoskeletal disorders	3
Rheumatoid arthritis	
Osteoarthritis	
(i) Dermatology	3
Psoriasis	
Scabies	
Eczema	
(j) Psychiatric Disorders	4
Depression	
Anxiety	
Psychosis	
(k) Ophthalmology	2
 Conjunctivitis (bacterial and viral) 	
Glaucoma	
(I) Anti-microbial Resistance	2
(m) Women's Health	4
Polycystic Ovary Syndrome	
Dysmenorrhea	

PHARMACOTHERAPEUTICS – PRACTICAL

Course Code: ER20-24P Hour/week)

25 Hours (1

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 the 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. Hyperlipidaemia
 - 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)

HOSPITAL AND CLINICAL PHARMACY – THEORY

Course Code: ER20-25T 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

- 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

S. No.	Торіс	Hours
1	Hospital Pharmacy	
	 Definition, scope, national and international scenario 	6
	 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 NABH Accreditation and Role of 	
	Pharmacists	
2	Different Committees in the Hospital	4
	• 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	Supply Chain and Inventory Control	14
T	 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 used for cold storage (Refrigerator, ILR, Walk-in-Cold rooms) 	
	 FEFO, FIFO methods Expiry drug removal and their disposal methods e.g., Narcotics Decumentation purchase and inventory 	
	Documentation - purchase and inventory	7
3	 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 	,
6	Compounding in Hospitals. Bulk compounding, IV admixture services and incompatibilities, Total parenteral nutrition	4
7	Radio Pharmaceuticals - Storage, dispensing and disposal of radiopharmaceuticals	2
8	Application of computers in Hospital Pharmacy Practice.	2
-	Electronic health records, Softwares used in hospital pharmacy	_
9	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.	12

	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	
	Mediaction Therepy Management, Home Mediaction Deview	
10	Clinical laboratory tosts used in the evaluation of disease	10
10	states - significance and interpretation of test results	10
	- Hoomotological Liver function Ronal function thursday	
	• Haematological, Liver function, Renal function, myrold	
	Tasta apposited with pardiag disorders	
	Tests associated with caldiac disorders	
	Pluid and electrolyte balance Dulmonory Eurotion Tooto	
11	Pullionary Function Tests Peiceping: Types of poiceping: Clipical manifestations and	6
11	Antidotes	0
	Drugs and Poison Information Centre and their services –	
	Definition. Requirements. Information resources with examples.	
	and their advantages and disadvantages	
12	Pharmacovigilance	2
	Definition, aim and scope	
	Overview of Pharmacovigilance	
13	Medication errors: Definition, types, consequences, and	6
	strategies to minimize medication errors, LASA drugs and	
	Tallman lettering as per ISMP	
	Drug Interactions: Definition, types, clinical significance of drug	
	Interactions	

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 the common laboratory reports to understand the need for optimizing the dosage regimen
- 3. How to report the suspected adverse drug reactions to the concerned authorities
- 4. Uses and methods of handling various medical/surgical aids and devices
- 5. How to interpret the 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 any 2 cases)
- 7. Vaccination and injection techniques (IV, IM, SC) using mannequins (5 activities)

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. Genesis and development of Drug / Poison Information centres in India
- 6. Role of Pharmacists in Transition of Care: Discharge cards, post hospitalization care, medicine reconciliation activities in developed countries
- 7. Total parenteral nutrition and IV admixtures and their compatibility issues
- 8. Concept of electronic health records
- 9. Invasive and Non-invasive diagnostic tests HRCT, MRI, Sonography, 2DECHO, X-rays, Mammography, ECG, EMG
- 10. Diagnostic Kits Pregnancy Test
- 11. Measures to be taken in hospitals, ICUs to minimize the Antimicrobial Resistance
- 12. Antimicrobial Stewardship Program

Field Visit

The students shall be taken in groups to visit a Govt / 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 filed visit shall be submitted.

PHARMACY LAW AND ETHICS – THEORY

Course Code: ER20-26T 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

Chapter	Topics	Hour
		S
1	General Principals of Law, History and various Acts related	2
	to Drugs and Pharmacy profession	
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.	5
	Pharmacy Practice Regulations 2015	
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.	23
	Manufacture of drugs – Prohibition of manufacture and	

75 Hours (3

	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, X and Y.	
	Sale of Drugs - Wholesale, Retail sale and Restricted	
	license, Records to be kept in a pharmacy	
	Drugs Prohibited for manufacture and sale in India	
	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	Medicinal and Toilet Preparations Act 1955:	2
	Objectives, Definitions, Licensing, Offences and Penalties	
5	Narcotic Drugs and psychotropic substances Act 1985	2
	and Rules Objectives, Definitions, Authorities and Officers,	
	Prohibition, Control and Regulation, Offences and	
	Penalties.	
6	Drugs and Magic Remedies (Objectionable	2
	Advertisements) Act 1954	
	Objectives, Definitions, Prohibition of certain advertisements,	
	Classes of Exempted advertisements, Offences and	
	Penalties.	
7	Prevention of cruelty to Animals Act-1960: Objectives,	2
	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.	
8	Poisons Act-1919: Introduction, objective, definition,	2
	possession, possession for sales and sale of any poison,	
	import of poisons	
9	FSSAI (Food Safety and Standards Authority of India)	2
	Act and Rules: brief overview and aspects related to	
	manufacture, storage, sale and labelling of Food	
	Supplements	
10	National Pharmaceutical Pricing Authority: Drugs Price	5
	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)	
11	Code of Pharmaceutical Ethics : Definition, ethical principles, ethical problem solving, registration, code of	5
	ethics for Pharmacist in relation to his job, trade, medical	
10	Medical Termination of Programmy Act and Pulse having	2
12	understanding/salient features	2
13	Role of all the government pharma regulator bodies – Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission (IPC)	1
14	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
15	Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, Schedule Y. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency Use Authorization	5
16	Blood bank – basic requirements and functions	2
17	Clinical Establishment Act and Rules – Aspects related to Pharmacy	2
18	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
19	Bioethics - Basic concepts, history and principles. Brief overview of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human participants	2
20	Introduction to the Consumer Protection Act	2
21	Medical Devices – Categorization, basic aspects related to	2
	manuracture and sale	

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 from the literature / media
- 5. Schedule H1 drugs and its implementation in India
- 6. Counterfeit / Spurious medicines
- 7. Drug Testing Labs in India
- 8. Generic Medicines
- 9. Before of after food/Medicines and Meals