PHARMACOLOGY

Objectives:

(a) Knowledge & Intellectual skills

At the end of the course, the learner shall be able to:

1. Understand the general principles of drug action and handling of drugs by the body in normal individuals including children, elderly, women during pregnancy & lactation; special situations like renal, hepatic disease and genetic variations
2. Prescribe drugs rationally by
   (a) Understanding the importance of both non-drug treatment and drug treatment
   (b) Selecting and prescribing drug(s) based on suitability, tolerability, efficacy and cost according to the needs of the patient for prevention, diagnosis and treatment of common ailments.
   (c) Choose the most appropriate formulation for the clinical condition.
   (d) Use antimicrobials judiciously for therapy and prophylaxis
3. Prescribe drugs for the control of fertility and be aware of the effects of drugs on the foetus.
4. Apply pharmacokinetic principles in clinical practice pertaining to the drugs used in commonly encountered clinical conditions and essential medicines.
5. Prescribe rationally, in a legible manner, using appropriate format and terms, medicines for common ailments and all National Health programmes.
6. Foresee, prevent and manage adverse drug events and drug interactions
7. Understand and implement the essential medicines concept for improving the community health care
8. Principles of pharmacoeconomics
9. Sensitization of evidence based medicine
10. Describe the clinical presentation and management of common poisonings including the bites and stings.

(b) Psychomotor Skills:

At the end of the course, the learner shall be able to:

1. Write a correct, complete and legible prescription for common ailments including the conditions in the National Health Programmes.
2. Calculate the drug dosage using appropriate formulae for an individual patient.
3. Administer the required dose of different drug formulations using appropriate devices and techniques (e.g., hypodermic syringes, inhalers, transdermal patches etc).
4. Advice and interpret the therapeutic monitoring reports of important drugs
5. Recognize and report adverse drug reactions to suitable authorities.
6. Analyse critically, drug promotional literature for proprietary preparations, in terms of the (a) pharmacological actions of their ingredients (b) claims of pharmaceutical companies (c) economics of use (d) rational or irrational nature of fixed dose drug combinations.
7. Retrieve drug information from appropriate sources, especially electronic resources.

(c) Attitudes & Communication skills:

At the end of the course, the learner shall be able to:

1. Communicate to patients regarding the optimal use of drug formulations, devices and storage of medicines.
2. Follow the drug treatment guidelines laid down for diseases covered under the National Health Programmes and be capable of initiating, monitoring treatment, recording progress, and assessing outcomes.
3. Motivate patients with chronic diseases to adhere to the line of management outlined by the health care provider.
4. Appreciate the relationship between cost of drugs and patient compliance.
5. Exercise caution in prescribing drugs likely to produce dependence and recommend the line of management.
6. Understand the legal aspects of prescribing drugs.
7. Evaluate the ethics, scientific procedures and social implications involved in the development and introduction of new drugs.

COURSE CONTENTS

Course Contents	Must Know	Must know	Desirable to know
Part I (Drug Oriented teaching)			
General Pharmacology			
Pharmacology: Definition, scope, various branches	✓		
General principles and mechanism of drug action	✓		
Concept of therapeutic Index and margin of safety	✓		
Drug nomenclature	✓		
Molecular mechanism of drug action		✓	
Structure activity relationship, Bioassay, Orphan drugs	✓		
Clinical Pharmacology – Basic Concepts			
Scope and relevance of clinical pharmacology	✓		
Routes of administration of drugs, drug delivery system	✓		
Pharmacokinetics – Absorption, Distribution, Metabolism, Excretion	✓		
Bioavailability and bioequivalence	✓		
Factors modifying drug action and drug dosage	✓		
Drug interactions Pharmacogenomics	✓		
Adverse Drug Reactions, Pharmacovigilance,	✓		
Therapeutic drug monitoring & Adherence	✓		
Essential drugs and fixed dose drug combinations, Pharmacoeconomics,	✓		
Drug Regulation & Drug Acts, Legal aspects, Inventory Control		✓	

	Must know	Desirable to know
Autonomic Pharmacology		
General principles of autonomic neurotransmission	✓	
Cholinergic and anticholinergic drugs	✓	
Adrenergic drugs and antiadrenergic drugs	✓	
Skeletal muscle relaxants	✓	
NO, VIP	✓	
Autacoids and related drugs		
Histamine receptor antagonists, their pharmacological actions, indications, adverse effects and precautions		✓
Pharmacology of drugs acting on prostaglandins, 5-HT receptors and leukotrienes		✓
Central Nervous System, Psychopharmacology, Drugs used in Anaesthetic practice		
Drugs used in epilepsy, selection of appropriate drug for various types of epilepsy and adverse effects of drugs	✓	
Hypnotics used currently in clinical practice, indications, contraindications, adverse effects, drug interactions	✓	
Opioid and analgesics; Pharmacological actions , indications, contraindications, adverse effects and drug interactions of commonly used analgesics	✓	
Non-steroidal anti-inflammatory drugs (NSAIDs): Pharmacological actions, indications, contraindications, adverse effects and drug interactions of commonly used drugs.	✓	
Drugs used in the treatment of Parkinson's disease: anticholinergic agents, dopamine agonists, MOAI, COMTI; their indications, contra-indications, adverse effects and drug interactions	✓	
Disease modifying agents in the treatment of rheumatoid arthritis	✓	
Pharmacology of ethanol and methanol poisoning	✓	
Agents used in the treatment of gout (acute and chronic)	✓	
Drugs used for psychosis, anxiety, depression, and manic depressive illness		✓
Drugs of addiction/abuse and dependence	✓	
General anaesthetics; Cardinal features, merits and demerits of commonly used anaesthetics, drug interactions	✓	
Pre-anaesthetic adjuvants: uses, indications, contraindications, adverse effects and drug interactions	✓	
Local Anaesthetic agents: Pharmacological basis, adverse drug reactions, Indications and complications of spinal anaesthesia	✓	
Neuroleptanalgesia, Disassociative anaesthesia	✓	
(Endogenous opioid peptides, and their functions, opioid receptors and their subtypes;Centrally acting muscle relaxants)		✓
Drugs for treatment of Alzheimers disease, cognitive enhancers	✓	

	Must Know	Desirable to know
Cardiovascular system		
Antihypertensive drugs, their mechanism of action, adverse drug reactions, drug interactions and basis of combining commonly used drugs	✓	
Pharmacology of calcium channel blockers	✓	
Drugs affecting Renin Angiotensin system	✓	
Approaches to treatment of myocardial Infarction Drugs used in treatment of angina pectoris	✓	
Drug treatment of peripheral vascular diseases		✓
Pharmacology of vasodilators and cardiac glycosides; usage in CHF	✓	
Treatment of paroxysmal supraventricular tachycardia, Atrial dysrhythmias, sudden cardiac arrest and ventricular fibrillation	✓	
Diuretics		
Diuretics: mechanism of action, pattern of electrolyte excretion under their influence	✓	
Short term side effects and long term complications of diuretic therapy	✓	
Therapeutic uses of diuretics, Antidiuretics	✓	
Drugs affecting blood and blood formation		
Anti-anaemic drugs : Mechanisms of iron absorption from GIT and factors modifying it, adverse drug reactions, oral and parenteral preparations, treatment of iron deficiency anaemia Pharmacology of folic acid, vitamin B12, vitamin K, erythropoietin	✓	
Anticoagulants: Mechanisms of action of heparin and oral anticoagulants, indications, monitoring of therapy and the treatment of bleeding due to their overdose, drug interactions	✓	
Drugs inhibiting platelet aggregations, their indications and precautions for their use.	✓	
Properties and indications for the use of plasma expanders	✓	
Fibrinolytics and anti fibrinolytics; Indications, adverse reactions	✓	
Hypolipoproteinemia drugs: Mechanism of actions, adverse drug reaction and indications	✓	
Respiratory system		
Drugs used in the treatment of bronchial asthma, mechanism of action, common side effects and precautions to be taken during their use	✓	
Antitussives: pharmacological actions, indications, contraindications and common side effects	✓	
Expectorants and mucolytic agents: mechanism of actions, side effects, and precautions to be taken	✓	
Gastro-intestinal system		
Pharmacotherapy of peptic ulcer, mechanism of actions, adverse drug reactions, contra-indications and precautions	✓	

	Must Know	Desirable to know
Antiemetic agents: mechanism of actions, uses, side effects	✓	
Pharmacological basis of use of drugs in diarrhea	✓	
Drugs used in ulcerative colitis	✓	
Management of Constipation, Irritable bowel syndrome	✓	
Drugs acting on Endocrine System		
Anterior pituitary hormones	✓	
Thyroid hormones and antithyroid drugs: Pharmacological actions, indications, contraindications and side effects.	✓	
Drugs used for pharmacotherapy of diabetes mellitus, mechanism of actions, contraindications, precautions during the use and side effects. Management of iatrogenic hypoglycemia and diabetic ketoacidosis	✓	
Sex hormones, their analogues and antagonists, uses in replacements and pharmacotherapy, outlining the rational for such use, C/I and s/e	✓	
Pharmacological approaches to contraception, s/e, precautions during use & C/I	✓	
Uterine relaxants, and uterine stimulants, indications, side effects, C/I	✓	
Hormones of adrenal cortex, their synthetic analogues, pharmacological actions, therapeutic uses, precautions, side effects and contraindications	✓	
Hormones and drugs affecting calcium metabolism, therapeutic indications, contraindications and side effects	✓	
Drugs used in the treatment of infertility		✓
Chemotherapy		
General principals of chemotherapy, rational use of antimicrobial agents, indications for prophylactic and combined uses of antimicrobials	✓	
Chemotherapeutic agents: penicillins, cephalosporins, aminoglycosides, broad spectrum antimicrobial agents, quinolones, sulphonamides and other newer drugs; their mechanism of actions, s/e, indications, resistance, drug interactions	✓	
Antiseptics, disinfectants and their use based on their pharmacological properties	✓	
Anticancer drugs, mechanism of actions, indications, s/e, C/I, precautions	✓	
Toxicology		
General principles of treatment of poisoning including snake bite		✓
Heavy metal poisoning and heavy metal antagonists		✓
Management of overdosage with commonly used therapeutic agents		✓
Miscellaneous		
Vaccines, Drugs modulating Immune system		✓
Vitamins		✓
Gene therapy, Radioactive material used in radiotherapy	✓	
Pre & Probiotics, Nutritional supplement, Drugs acting on skin & mucus mem	✓	
Sports medicine, E-Learning		✓
Reactive oxygen species, Antioxidants	✓	

	Must Know	Desirable to know
Part II (Clinical Pharmacology and Therapeutics)		
National Health programmes like:		
1. Tuberculosis	✓	
2. Leprosy	✓	
3. HIV and STD	✓	
4. Malaria	✓	
5. Syphilis and gonorrhea	✓	
6. RCH programme	✓	
7. Upper and lower respiratory infections	✓	
8. Diarrhea	✓	
9. OCP	✓	
10. Filariasis	✓	
11. Anaemia	✓	
12. Diabetes Mellitus	✓	
Infective/Parasitic conditions		
1. Influenza	✓	
2. Urinary Tract infections	✓	
3. Typhoid and other GIT infections	✓	
4. Amoebiasis	✓	
5. Worm infestations	✓	
6. Fungal Infections	✓	
7. Herpes and Hepatitis	✓	
Other common conditions		
1. Hypertension	✓	
2. Angina Pectoris, Myocardial Infarction, cardiac arrest	✓	
3. Congestive Cardiac Failure	✓	
4. Obesity	✓	
5. Shock and other emergencies	✓	
6. Hyperlipidemia	✓	
7. Thyroid disorders	✓	
8. Osteoporosis	✓	
9. Epilepsy	✓	
10. Parkinsonism	✓	
11. Asthma and COPD	✓	
12 . Peptic ulcer	✓	
13. Osteoarthritis and gout, Rheumatoid arthritis	✓	

	Must Know	Desirable to know
Other topics:		
1. Treatment of pain	✓	
2. Treatment of insomnia	✓	
3. Treatment of cough	✓	
4. Treatment of fever of unknown origin (PUO)	✓	
5. Drugs used in labour	✓	
6. IV fluids	✓	
7. Clinical uses of glucocorticoids	✓	
8. P-drug or how to select a drug for a given patient in a given situation	✓	
9. Essential drugs	✓	
10. Drug therapy in special situations (pregnancy, lactation, children, geriatrics, renal and hepatic diseases)	✓	

SKILLS

SKILLS:	Able to do Independently	Able to perform under guidance	Assist	Observe
1. Dosage forms				
Oral	✓			
Parenteral	✓			
Topical & Others	✓			
2. Routes of drug administration, setting up an intravenous drip	✓			
3. Calculation of drug dosage	✓			
4. Sources of drug information – how to retrieve information	✓			
5. ADR monitoring	✓			
6. Therapeutic Drug Monitoring	✓			
7. Critical appraisal of drug promotional literature	✓			
8 Essentials of Clinical trials	✓			
9. Communicating to patients on the proper use of medication	✓			
10. Selection of P drug	✓			
12. Prescription writing, prescription auditing and standard treatment protocols	✓			
13. Essential drugs list	✓			

SKILLS:	Able to do Independently	Able to perform under guidance	Assist	Observe
14.Use of drugs in pregnancy, lactation children and elderly	✓			
15. Use of drugs in liver disease and renal disease	✓			
16. Ethics in clinical trials, therapy	✓			
17. Preparation of test dose for penicillin solution	✓			
18. Preparation and use of oral rehydration solution	✓			
19. Informed Consent Form	✓			
20. Computer assisted learning (CAL)	✓			
21. Experimental pharma, Bed side clinical pharma training	✓			

22. **Graph construction** – Dose response curve, Pharmacokinetic parameters, Therapeutic index, competitive agonist and antagonists

23. Drug/ drug and Drug/Food interaction

24. Labels analysis and interpretation

Teaching –Learning Methods: The following objectives will be covered using theory lectures, small group discussions, simulated clinical case discussions, therapeutic auditing, problem based learning, e-learning and any other teaching learning method which the teacher chooses to select. An overlap between theory and practical classes will serve to reinforce and complement the two. Points not covered in theory can be covered during practical classes.

Integration: During the 7th and 8th semesters, clinical pharmacology with major focus on therapeutics will be taught. This will be done by integrated teaching wherein departments of Pharmacology, Medicine, Psychiatry, Paediatrics etc will come together and discuss common clinical problems in the form of case discussion. The focus will be on therapeutics.

Suggested areas for integrated teaching in Pharmacology are as follows:

1. Autonomic N System
2. Endocrinology
3. Chemotherapy incld
4. parasitology
5. Central N System
6. Anticoag , Hypolip etc
7. Toxicology
8. Vaccines
9. Diabetes
10. Nutritional deficiencies

Recommended book for undergraduates

1) Basic and Clinical Pharmacology Lange publications by Bertram G Katzung

2) Pharmacology by H P Rang, M M Dale, J M Ritter, P K Morore

3) Principles of Pharmacology by H L Sharma, K K Sharma

4) Essentials of Medical Pharmacology K D Tripathi

Evaluation

No long Qs/ Long Qs

MCQs / Avoid MCQs

Marks for work book

Viva, Structural viva- f or rational therapeutics

(The following to be included for evaluation)

Emergency therapeutics- anaphylaxis

Snake bite

Febrile convulsions

Comment, Correct rewrite /Prescription audit

Clinical Problems

Dose Calculations

Experimental pharmacology (annual)

Qualitative/ Quantitative experiment charts

Clinical pharmacology charts

Communication skill

ORS

Computer assisted learning