CURRICULUM

MBBS – Pharmacology

2017- 18

Department of Pharmacology

ALL INDIA INSTITUTE OF MEDICAL SCIENCES

Rishikesh – 249201

Pharmacology, as a discipline, is a dynamic interface of pre-clinical, para-clinical and clinical medical disciplines. Being a bridging subject, its mastery is crucial for a successful career in medicine.

COURSE OBJECTIVES

A process of rational thinking and scientific temper shall be inculcated in a medical student so that he/she shall be competent, as a physician, to prescribe drugs to patients effectively and safely.

To equip students with the knowledge of rational drug therapy, its importance and application.

To train the budding doctors to be life-long learners of rational therapeutics by promoting self-directed learning.

The teaching of undergraduates has undergone a significant change in recent years, which has been incorporated in the pharmacology curriculum.
Several topics of Clinical Pharmacology have been introduced in the form of lectures/group discussions/tutorials & integrated with other disciplines.

Greater emphasis is placed on tutorials/group discussions on rational prescribing, prescription-writing skills, therapeutic problem-solving, prescription audit, drug interaction exercises and ADR monitoring.
Animal experimentation has been replaced with Computer-Simulated Exercises.

Teaching/Learning of undergraduate MBBS students, would utilize innovative Problem-Based Learning methodologies based on Best Evidence Based Education.
Student feedback would form an important component of all the teaching – learning activities.

Having successfully completed an undergraduate course in Pharmacology, graduates will be able to integrate and apply the knowledge, skills and attitudes detailed in this core curriculum.

Domains of Learning objectives

The three major domains of the course objectives are

- Knowledge–Theory
- Skills– Practical
- Attitudes– including communication skills

CORE KNOWLEDGE

Having successfully completed the course in Pharmacology, the medical graduates will have knowledge and understanding of:

Drugs that can be used in health and disease, giving examples from body systems

How drugs interact with their targets, including drug-receptor theory

Pharmacodynamics (molecule to whole organism)

Pharmacokinetics (absorption, distribution, metabolism & excretion)

How physiological and pathophysiological processes are affected by drug action

Pharmacogenomics

Pharmacovigilance and reporting of ADRs

Principles of toxicology and their application in safety pharmacology

Drug interactions, medication errors and misuse of drugs

Drug development

Rational and Evidence-based prescribing

CORE SKILLS

Having successfully completed the course in Pharmacology, the medical graduates will have ability to:

Prescribe drugs safely, effectively and economically

Establish an accurate drug history

Plan appropriate drug therapy for common indications

Provide a safe and legal prescription

Calculate appropriate drug doses and record the outcome accurately

Provide patients with appropriate information about their medicines

Access reliable information about medicines

Detect and report adverse drug reactions

Adhere to national guidelines and local formularies

Demonstrate awareness that many patients use complementary and alternative therapies

CORE ATTITUDES

Having successfully completed the course in Pharmacology, the medical graduates will have:

A curious and scientific attitude and openness

Organise and accurately record information e.g. in a laboratory book

Ability to work independently

Ability to work constructively in small groups or teams

The skills for active and lifelong learning e.g. independence, time management

COURSE CONTENT- LEARNING OBJECTIVES

Topics	MUST KNOW	SHOULD KNOW	NICE TO KNOW
General Pharmacology			
Routes of drug administration	Compare the advantages and disadvantages of various routes of drug administration.	Determine the suitable route of drug administration for a given patient	Targeted drug therapy
Drug transport across the membrane	Explain various mechanism of drug transport across the membrane Explain factors affecting drug transport Analyze the effect of pH of drug on its absorption and excretion		
Pharmacokinetics - Absorption	Explain various factors affecting absorption and first pass metabolism Compare Bioavailability of various routes and factors influencing it Interpret the clinical implication of bioavailability		

	Explain the concept of bioequivalence		
Pharmacokinetics - distribution	Describe Distribution Explain the various factors affecting distribution of drugs		
Pharmacokinetics – metabolism	Enlist different types of metabolic transformations that drugs undergo with suitable the examples Describe the role of Cytochrome P450 enzymes in biotransformation Explain the role of enzyme induction and inhibition of metabolic enzymes in drug metabolism. Explain the pharmacokinetic drug interactions due to drug metabolism		
Pharmacokinetics – Elimination	Enumerate various routes of drug elimination with examples Explain various factors affecting drug renal excretion Interpret the clinical significance of renal disease and hepatic disease on drug elimination		
Pharmacodynamics	Drug – Receptor Interactions Receptor signaling mechanisms Graded dose-response relationships Therapeutic Index	Second messengers Quantal dose – response relationships Molecular models of receptors	Spare receptors
Drug Metabolism	Types of metabolic transformations Mechanisms of drug-drug interactions Common CYP mediated drug-drug interactions	Non-CYP pathways for drug metabolism	Mathematical models for rate of reactions of drug metabolism
Factors modifying drug action	Explain various factors modifying the drug action with examples		

	Analyse the effect of particular factor on drug disposition for ex. Extreme of age		
Clinical pharmacokinetics	Explain the concept of pharmacokinetic parameters Calculate various pharmacokinetic parameters from the given data Interpret the clinical significance of these parameters		
Adverse drug reaction	Explain the mechanistic basis of adverse drug reactions(ADRs) including the pharmacodynamic& pharmacokinetic basis Explain the characteristics of Type A and B ADRs according to the Rawlins & Thompson classification Discuss the effects of diet, age, sex, pharmacogenetics and pharmacogenomics on ADRs Discuss the effects of diseases of the liver and kidney on ADRs		
Drug interaction	Explain the basic principles of drug interaction Detect / anticipate the beneficial or harmful drug interation. Critically analyse given drug interactions from a clinical scenario		
Drug Discovery and Development		Preclinical drug evaluation, Clinical Trials, Phases of Clinical Trials	Drug regulation
Autonomic nervous system			

Introduction to ANS	Outline the general principles of autonomic neurotransmission		
Cholinergic neurotransmission and cholinergic drugs	Enumerate the various types of receptors and their agonists and antagonists, Classify the cholinergic drugs Enumerate the therapeutic indications, Contraindications and common side effects of cholinergic drugs Explain the rationale of use or reason of adverse effect with the use of cholinergic agents Outline steps in the pharmacotherapy of treatment of organophosphorous poisoning Outline pharmacotherapy of treatment of myasthenia gravis	Mechanism of organophospate poisoning	Chemical warfare agents
Anticholinergics	Atropine Organophosphate poisoning: Symptoms & Management	Other clinical uses of Cholinergic and anti-cholinergic drugs	
Skeletal muscle relaxant	Enumerate the different skeletal muscle relaxants, their clinical use, adverse effect and contraindication Differentiate between depolarising and non-depolarising blockers Compare the therapeutics uses of centrally acting and peripherally acting muscle relaxants		
Adrenergic neurotransmission and cholinergic drugs	Explain the pharmacological modulation of adrenergic neurotransmission Enumerate the various types of		

	receptors and their agonists and antagonists,		
Antiadrenergic drugs-alpha blockers	Classify the alpha adrenoceptor blocking agents Explain the mechanism of action, pharmacological actions, therapeutic uses, side effects, and contraindications of alpha adrenoceptor blocking agents Discuss the principles of treatment of benign prostatic hyperplasia with the alpha adrenoceptor blocking agents		
Antiadrenergic drugs-Beta blockers	Classification of beta-blockers Pharmacological actions of beta-blockers ADR and Contraindications of beta-blockers Clinical uses of beta-blockers	Beta-blockers in acute and chronic congestive cardiac failure	1. Beta-blockers with multiple actions
Pharmacotherapy of glaucoma	Classify the agents used in the management of glaucoma Explain the mechanism and use in management of glaucoma for each group.		
Cardiovascular Pharmacology			
Antihypertensives	Definition & stages of hypertension Classification of anti-hypertensive drugs MoA, ADR & Contraindications of drugs for out-patient management of hypertension namely ACE-I, ARB, Thiazide diuretics, Calcium Channel blockers	JNC 8 guidelines Commonly used combination of anti-hypertensive drugs	Choice of anti-hypertensive according to compelling indications

	Drugs for hypertensive emergencies & urgencies		
Antianginals	Discuss the pathophysiology of angina Classify the various drugs used in the treatment of angina pectoris Explain the mechanism of action of the drugs used in the management of angina Enumerate the adverse effects, contraindication of the major drugs class Outline the management of angina		
Treatment of myocardial Infarction	Explain the rationale of various drugs used in the management of acute coronary syndrome Outline the management of myocardial Infarction and unstable angina		
Pharmacotherapy of CHF	Review the definition, causes and pathophysiology of CCF Classify the various agents used in the treatment of CCF Explain the mechanism of action, pharmacological actions, therapeutic uses, side effects, and contraindications of various agents used in the treatment of CCF		
Antiarrythmics	Review the properties of cardiac electrophysiology & function Review the definition, causes and pathophysiology of cardiac arrhythmias Classify the various agents used in the treatment of cardiac arrhythmias(Vaughan		

	-Williams-Singh & Sicilian Gambit) Explain the mechanism of action, pharmacological actions, therapeutic uses, side effects, and contraindications of various agents used in the treatment of cardiac arrhythmias		
Pharmacotherapy of shock	Discuss the pathphysiology of shock. Enumerate various agents used in the management of shock,. Rationale of use of adrenaline a		
Drug used in dyslipidemia	Classify various hypolipidemic drugs based of their mechanism Explain the mechanism of actions, adverse drug reaction and indications of all the hypolipidemic agents		
Diuretics	Review the basic mechanisms of transmembrane transport of solutes Classify the various diuretic agents Explain the site & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of various diuretic agents		
Drug used in coagulation – anticoagulants (UFH/LMWH) (warfarins /DTI/oral factor X inhibitors) (fibrinolytic /Antifibrinolytic/antiplatelet)	Coagulation pathway with respect to pharamacotherapeutic agents Classification of Anti-coagulants and thrombolytics MoA, ADR, Pharmacokinetic issues related with heparin & warfarin Differences between heparin and LMWH	Clinical use of anti-coagulants and thrombolytics Direct Thrombin Inhibitors Clinical use of anti-platelet agents	Anti-platelet agents other than aspirin &clopidogrel Drug-drug interactions of anti-platelet agents

	MoA, ADR of streptokinase Anti-platelet agents Aspirin &clopidogrel		
Agents used in anemia	Types of anemia Classification of drugs used for treating anemia MoA & ADR of Oral & parenteral iron preparations Guidelines for management of iron-deficiency anemia	Pathophysiology of anemia other than iron-deficiency anemia Clinical use of Folic acid and Vit B12	Hormonal agents stimulating haematopoiesis
CNS Pharmacology			
Introduction to CNS	Explain the steps of neurotransmission Enumerate various Neurotransmitters and neuromodulators Explain the general action of CNS drugs		
Sedative hypnotics	Classify the various sedative-hypnotic agents Explain the site & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of various sedative-hypnotic agents		
Alcohols	1. Types of alcohols 2. Metabolism of alcohols 3. Pharmacodynamics and pharmacokinetics of ethanol 4. Drugs for managing alcohol dependence	1. MoA, ADR of drugs for managing alcohol dependence	1. Non-pharmacological strategies for managing alcohol dependence
General anaesthesia	1. Definition of GA 2. Stages of Anaesthesia 3. Classification of drugs 4. ADR of agents used for GA	1. Pharmacokinetics of agents used for GA 2. situation specific use of anaesthetic agents	1. MAC & its effects on inhalational anaesthetic agents
Local anaesthesia	1. Classification of LA 2. Mechanism of Action	1. Uses of LA 2. Complications of LA	1. Physiochemical properties of LA

	3. ADR of LA	according to use	
Antiseizure agents	1. Definition & types of epilepsy 2. Classes of anti-epileptics 3. MoA, ADR, DDI of phenytoin, Carbamazepine, valproate, Ethosuximide 4. Names of newer anti-epileptics 5. Management of Status epilepticus	1. Mechanisms of seizures 2. MoA of new anti-epileptics 3. Drugs used for specific seizure types	1. Animal Models of epilepsy 2. Role of therapeutic drug level monitoring in management of epilepsy
Antipsychotic agents	Review the definition, signs and symptoms of psychoses Classify the various antipsychotic agents Explain the site & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of various antipsychotic agents		
Pharmacotherapy of mania	List and classify the antimanic agents. Explain the site & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of lithium and other alternative antimanicagents		
Antidepressant agents	Review the definition, signs and symptoms of mental depression Classify the various antidepressant agents Explain the site & mechanism of action, pharmacological actions, therapeutic		

	uses, side effects and contraindications of various antidepressant agents		
Antiparkinsonian drugs	Classify various drugs used in the treatment of Parkinson's disease based on mechanism Explain the mechanism, contra-indications, adverse effects and drug interactions of all the classes of drug used in Parkinson's disease		
Opioid agonist and analgesics	Endogenous Opioids Classification of opioid analgesics ADR of Opioid analgesics Tolerance & Dependence	1. Situation specific use of opioids 2. Use of opioids for pain management	1. Guidelines for pain management
Drug of abuse	Enumerate major classes of drugs of abuse Explain the basic concept of reinforcement, tolerance, withdrawal symptoms and psychological dependence Outline the basic principles for mananagement of drug dependence		
Autocoids			
Eicasonoids	Describe the pathophysiological roles of Eicosanoids PGs & LKTs; Explain the mechanism , uses & ADRs of prostaglandins		
NSAIDs	Explain the pathophysiology of inflammation, pain and fever and role of cyclooxygenase		

	enzymes and prostaglandins Explain the mechanism of action, adverse effects, indications, contraindications and potential drug interactions of: a) Aspirin and the salicylates b) Traditional NSAIDs e.g. ibuprofen and naproxen c) Celecoxib d) Acetominophen Explain the rationale of use of these drugs for various indications Describe the mechanisms underlying acetominophen poisioning and its treatment		
Histamine & antihistamine	Review the roles of histamine as a central neurotransmitter, and as a chemical mediator of allergic reactions Classify the antihistaminic agents Explain the site & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of various antihistaminic agents		
Serotonin, ergot alkaloids and migraine	Review the roles of serotonin as a central & peripheral neurotransmitter Classify the agents modulating the actions of the serotonergic system Classify the ergot alkaloids Explain the sites & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of serotonergic and		

	antiserotonergic agents as well as ergot alkaloids		
Vasoactive peptides	RAAS system and its modulators RAAS in cardiovascular disorders Classification of RAAS Modulators MoA, ADR & Clinical use of ACE-I & ARB	1. Other vasoactive peptides like bradykinin, ANP, cGRP	1. New drugs acting through vasoactive peptides
Chemotherapeutic agents			
General principles of antimicrobial therapy	Review the common terminology & molecular targets related to antimicrobial chemotherapy Explain the general guiding principles for antibiotic therapy including synergism and antagonism. Outline the mechanisms of resistance to antimicrobial agents Discuss the principles for rational selection of antimicrobial agents in terms of host, microbial and drug factors		
Cell wall active antibiotics	Classification of beta-lactam antibiotics MoA and spectrum of classes of beta-lactam antibiotics Mechanism of resistance to beta-lactam antibiotics Beta-lactamase inhibitors ADR of beta-lactam antibiotics	1. Pharmacokinetics of specific beta-lactam antibiotics 2. Clinical uses of specific beta-lactam antibiotics	1. Mechanism of hypersensitivity to beta-lactam antibiotics
Macrolides	Enumerate the macrolide antibiotis Describe the mechanism of action, pharmacokinetics, Indications and ADR of macrolide		

Chloramphenicol, Tetracyclines	Describe the mechanism of action, pharmacokinetics, Indications and ADR of Chloramphenicol Describe the mechanism of action, pharmacokinetics, Indications and ADR of tetracycline		
Aminoglycosides & Spectinomycin	Classification of Aminoglycoside MoA, ADR of Aminoglycoside Clinical uses of Aminoglycoside	1. Pharmacokinetic considerations for specific Aminoglycoside 2. Dose modification for Aminoglycoside	1. Mechanism of resistance to Aminoglycoside
Fluoroquinolones	1. Classification of Fluoroquinolones 2. MoA, ADR of fluoroquinolone 3. Clinical uses of fluorquinolones	1. Mechanism of resistance to Fluoroquinolones 2. Pharmacokinetic considerations for specific Fluoroquinolones	1. Dose modification for Fluoroquinolones
Miscellaneous antibiotics (polymyxins , clindamycin, oxalidinones)	Enumerate the miscellaneous antimicrobial agents used Explain the use, mechanism , adverse effect and contraindication of agents		
Antimycobacterial	1. Classification of anti-tubercular agents 2. Adverse effects & contraindications of all classes of anti-tubercular drugs 3. Treatment of pulmonary tuberculosis	1. Mechanism of action of anti-tubercular drugs 2. Mechanism of resistance to anti-tubercular drugs 3. Second line anti-tubercular drugs	1. New anti-tubercular drugs
Antileprotic	Enumerate the agents used in the management of leprosy Explain the use, mechanism , adverse effect and contraindication of agents used in leprosy	Outline the Treatment approach for leprosy	

Chemotherapy of UTI, enteric fever, clostridium difficile	Enumerate the drugs used in the treatment of urinary tract infection; Outline the management of UTI in special clinical situations Enumerate the drugs used in the management of enteric fever. Outline the management of enteric fever.		
Antiprotozoal drugs (antiamoebic agents and others)	Explain the indications, mechanism of action, adverse effects and contraindications for the major drugs used in the treatment of protozoal Differentiate between tissue and luminal amoebicide		
Antimalarial agents	Types of malaria Classification of anti-malarials Adverse effects & contraindications of all classes of anti-malarials Treatment of malaria	Mechanism of action of anti-malarials	New anti-malarial drugs
Antihelmintic	1. Approaches to anti-helminthic chemotherapy 2. Major anti-helminthic drugs 3. Adverse effects and contraindications of anti-helminthic drugs	MoA of anti-helminthic drugs	Drugs used in National program for control of helminthiasis
Antiviral	Classify the antiviral drugs based on their spectrum Explain the general characteristics of each class like their mechanism of action, spectrum, indication and adverse effects		
Antiretroviral	Classify the antiretroviral drugs based on their mechanism of action Explain the general characteristics of	Explain the basic principles of HAART	

	each class like their mechanism of action, spectrum, indication and adverse effects		
Antifungal	Classify the various antifungal drugs Explain the site & mechanism of action, pharmacological actions, therapeutic uses, side effects and contraindications of various antifungal drugs		
Antineoplastic	Explain in lay terminology the multistage process of carcinogenesis, invasion, metastases, and angiogenesis. Define the following terms related to the genetic basis of cancer: protooncogenes, oncogenes, tumor suppressor genes, DNA repair genes, cell cycle clock, apoptosis, cellular senescence, and telomeres. Use the Gompertzian growth curve to define the following terms related to cancer growth: exponential tumor growth, growth fraction, tumor burden, and doubling time. Classify a chemotherapy agent as cell-cycle specific or nonspecific. Explain the impact this has on the administration		

	schedule of the agent. Explain the mechanism of action of commonly used anticancer chemotherapy drugs. Given a class of cytotoxic drugs, describe toxicities that are common to the class and toxicities that are unique to specific drugs within that class. Interpret patient-specific laboratory indicators liver and/or renal function, and recommend dose modification for commonly used chemotherapy agents if needed. Compare and contrast the use of leucovorin in conjunction with chemotherapy regimens containing fluorouracil versus its role in regimens containing methotrexate. Compare and contrast the naming and adverse effects of different types of monoclonal antibodies. Determine the source of the monoclonal antibody given the drug name. List the monoclonal antibodies approved for cancer treatment along with their mechanism, antigenic target,		

	clinical use, and toxicity. Describe the role of the human epidermal growth factor receptor and vascular endothelial growth factor in cancer growth. Compare the mechanism of action between monoclonal antibodies and tyrosine kinase inhibitors that target these receptors. Define the different definitions used to evaluate the response of the tumor to therapy. Describe the role of tumor heterogeneity in the design of chemotherapy drug regimens. Outline patient and tumor specific factors that can affect the outcomes of cancer or targeted therapy in a patient. Include tumor-related, drug-related, and patient-related factors in this outline. Calculate the dose of a chemotherapy agent to be administered using the body surface area (BSA) or Calvert equations.		
Immunomodulators	Classify drugs used for immunomodualtion. Explain the indications, mechanism of action and potential adverse effects of the major classes of		Plan out the treatment plan for patient undergoing organ transplant

	immunomodulatory drugs.		
DMARDs & BRM	Explain the pathophysiologic mechanisms for rheumatoid arthritis. Discuss the mechanism of action of the biologic agents infliximab, adalimumab, etanercept, anakinra, abatacept, and rituximab. Define major toxicities of disease-modifying antirheumatic drugs. Define advantages and limitations in the use of chronic corticosteroid therapy for rheumatoid arthritis. List the contraindications to methotrexate therapy. List the drugs used for treating rheumatoid arthritis that would be contraindicated in pregnancy. Discuss the benefits and drawbacks of the use of nonsteroidal antiinflammatory drugs as monotherapy to treat rheumatoid arthritis.	Design a therapeutic plan to treat rheumatoid arthritis. Design a monitoring plan to follow disease progression of rheumatoid arthritis. Design a monitoring plan for drug therapy toxicity in rheumatoid arthritis. Develop a progressive stepwise plan for treatment of rheumatoid arthritis in a patient who does not respond to therapy.	
Pharmacotherapy of gout	Discuss the pathophysiology of gout and hyperuricemia.	Evaluate a patient's response to antihyperuricemic therapy for safety and efficacy.	

	Describe comorbidities that are commonly associated with gout. Construct the clinical presentation of the various forms of gout. Arrange in order of predilection the anatomic sites involved in acute gouty arthritis. Contrast the likelihood of nephrolithiasis in patients with hyperuricemia based on urinary pH and uric acid excretion rates. Differentiate the two types of gouty nephropathy based on pathophysiologic mechanisms. Identify the most common sites of tophaceous gout. Formulate a plan for treating acute gouty arthritis in a patient who has been symptomatic for more than 48 hours. Formulate a plan for treating acute gouty arthritis in a patient with recent (<24 hours) onset. Recommend a treatment for acute gouty arthritis in a patient who is unresponsive to colchicine and indomethacin therapy.		

	Design a treatment plan for uric acid nephrolithiasis. Identify gout patients in whom prophylactic therapy should be implemented. Recommend appropriate antihyperuricemic therapy when indicated. Describe lifestyle ations that promote ion of hyperuricemia.		
Hormones and Hormone antagonists			
Hypothalamic and pituitary hormones	1. Hormones secreted by anterior pituitary 2. Agonists and antagonists of Growth hormone, Prolactin, Leutenising hormone and Follicle-stimulating hormones 3. Physiological actions of these hormones	1. Second messengers involved in signal transduction	1. Clinical uses of Agonists and antagonists of anterior pituitary hormones
Thyroid and antithyroid drugs	Describe the signs and symptoms of hyperthyroidism and hypothyroidism. Outline the changes seen in thyroid function tests (free and total triiodothyronine [T_3] and thyroxine [T_4], force-time integral [FTI] and thyroid-stimulating hormone [TSH]) and the radioactive iodine uptake (RAIU) scan in hyperthyroidism and hypothyroidism. Describe the mode of action, patient	Outline the treatment for thyroid storm and Gravesophthalmopath y	

	selection, maintenance and maximal doses, drug interactions, and adverse effects for thionamides, radioactive iodine (RAI), β-blockers, and iodides. . Compare and contrast the products available for thyroid supplementation in hypothyroidism; describe the drug of choice. Outline the starting and maintenance doses and adverse effects for levothyroxine as well as the end point and monitoring of therapy.		
Adrenocorticsteroids and adrenocortical antagonists	Describe the roles of the various zones of the adrenal cortex in hormone synthesis. Explain the regulation of glucocorticoid, adrenal androgen, and mineralocorticoid secretion. Describe and differentiate the various etiologies of Cushing's syndrome. Interpret the results of laboratory tests used to diagnose Cushing's syndrome. Compare and contrast therapeutic regimens for treatment of Cushing's syndrome, based on the etiology		

	of the disease in a particular patient. Discuss the methods of, and rationale behind, steroid replacement in the treatment of adrenal adenoma. Explain the difference between primary and secondary aldosteronism. Interpret the results of laboratory tests used to diagnose primary aldosteronism. Recommend a therapeutic regimen for treatment of primary aldosteronism, based on the etiology of the disease in a particular patient. Compare and contrast the symptoms and presentation of patients with primary and secondary adrenal insufficiency. Construct a treatment plan for a patient with acute adrenal insufficiency. Describe how specific enzyme deficiencies lead to congenital adrenal hyperplasia. List several options for the treatment of hirsutism. Discuss some of the potential side effects of systemic glucocorticoid use,		

	and how the risk of developing these side effects can be minimized. Recommend appropriate counseling points for a patient initiating long-term glucocorticoid therapy.		
Pancreatic hormone and oral hypoglycemic agents	Classify various drugs used for pharmacotherapy of diabetes mellitus, Explain their mechanism of actions, contraindications, precautions during the use and side effects. Specify the clinical status of oral antidiabetic drugs Outline the management of diabetic ketoacidosis		
Female gonadal hormones and inhibitors	Enumerate estrogen and progesterone analogues and antagonists, Explain the mechanism, uses, side effects and contraindication of these drugs Outlining the rational of use in replacements and other indication,		
Male gonadal hormones and inhibitors	1. Physiological effects of anabolic hormones 2. Classification of drugs 3. Clinical uses and ADR of anabolic steroids	1. Androgenic to anabolic ratio of drugs used for anabolism 2. Selection of anabolic agents	1. Doping and performance enhancement
Oral contraceptive pills	Outlining the pharmacological approaches to contraception, Enumerating the side effects, precautions during use and contraindications of		

	hormonal contraception		
Drugs acting on uterus	Enumerate various drugs used as uterine relaxants Explain the mechanism, side effects and contraindications of uterine relaxants Specify the status of clinical use of these agents		
Drugs affecting bone mineral homeostasis	1. Physiology of calcium metabolism 2. Pharmacological agents affecting calcium metabolism 3. MoA, ADR of Bisphosphonates, Vit D	1. Pharmacology of Calcitonin	1. Treatment of osteoporosis
Respiratory Pharmacology			
Bronchial asthma	Classify the drugs used in the management of bronchial asthma Explain the mechanism of action, common side effects and precautions to be taken during their use. Explain the rationale of use of corticosteroids in asthma Specify various routes of drug administration in asthma and their significance		
Antitussives	Cough: pathophysiology; Enumerate the agents used in cough Explain the mechanism of action of antitussives; mucolytics & expectorants, demulcents.		
Gastrointestinal Pharmacology			

Drugs used in peptic ulcer disease	Explain the pharmacological targets of drugs used to treat peptic ulcer Classify the drugs used for control of gastric acidity & t/t of peptic ulcers Describe the mechanism, adverse effect and uses of these agents Describe the management of H.pylori infection & gastroesophageal reflux disease; Describe prokinetic drugs & agents used in irritable bowel syndrome.		
Antiemetic drugs	1. Mechanisms of emesis 2. Classification of anti-emetics 3. Clinical uses of different classes of anti-emetics	1. ADR of anti-emetics	1. New anti-emetics
Pharmacotherapy of diarrhea and constipation	Drugs used for diarrhea, constipation & inflammatory bowel disease; agents used for biliary & pancreatic disease; rehydration therapy		
Miscellaneous			
Heavy metals intoxication and chelators	Enlist the potential indications and adverse effects of the most commonly used chelators		
Antiseptics and disinfectants	Enlist the potential indications and adverse effects of the most commonly used antiseptics and disinfectants		
Vaccines and sera	Enlist the potential indications and adverse effects of the most commonly used vaccines and sera Enlist the vaccines included in the national immunization program of india		

Vitamins	Describe the clinical conditions associated with deficiencies of the major vitamins Identify the typical patient groups that can benefit from vitamin supplements Identify specific health risks associated with overconsumption of major vitamins		
Dermatological pharmacology	Enlist the drugs used in the treatment of dermatological problems Describe the potential indications and adverse effects of the most commonly used agents	Describe the mechanism and adverse effects of drugs used in treatment of psoariasis	

PHARMACOLOGY PRACTICAL- SPECIFIC LEARNING OBJECTIVES

S. no	Topic	MUST KNOW	SHOULD KNOW	NICE TO KNOW
1	Introduction to clinical pharmacy	1. List the various sources of some common drugs and identify them. 2. Define the various terms relating to pharmacology such as clinical pharmacology, therapeutics, pharmacy, toxicology, pharmacovigilance, pharmacogenomics, ethnopharmacology etc.,		
2	Clinical pharmacy (Dosage forms)	1. List the common dosage forms pertaining to the various routes of administration. 2. Instruct patients on the correct method of using these common dosage forms 3. Explain to patients the precautions to be taken during use of these dosage forms		
3	Calculation of drug dosage and percentage solutions	1. Calculate the quantity of drug present in a given solution. 2. Appreciate the importance of calculating the total quantity of drug and its conversion from percentage and molar solutions for individualization of therapy.		
4	Study of the action of drugs on the rabbit's eye computer assisted learning (CAL) method	1. Demonstrate and study the effects of drugs on the rabbit's eye. 2. Record, analyse and interpret the observations obtained during the experiment.		
5	Effect of drugs on the ciliary motility of frog oesophagus - computer assisted learning (CAL) method	1. Explain the effect of drugs on ciliary motility of frog oesophagus. 2. Interpret the observations and explain the basis for the same. 3. List the uses of cholinergic and anticholinergic drugs and explain the basis for their use in each condition.		
6	Effect of drugs on perfused frog's heart – computer assisted learning (CAL) method	1. Explain the effect of drug on perfused frog heart 2. Interpret the observations and explain the basis for the same. 3. List the cardiac stimulants & depressants and understand the rationale for their use in therapy		

7	Effect of physostigmine on drc of acetylcholine on frog rectus abdominis muscle - computer assisted learning (CAL)	1. Understand the basic principles and importance of potentiation 2. Use the CAL software for demonstrating shift in DRC in the presence of physostigmine on DRC of acetylcholine on frog rectus abdominis muscle.		
8	Effect of atropine on drc of acetylcholine on rat ileum - computer assisted learning (CAL)	1. Understand the basic principles and importance of antagonism 2. Use the CAL software for demonstrating shift in DRC in the presence of atropine on DRC of acetylcholine on rat ileum.		
9	Effect of spasmogens and spasmolytics on rabbit jejunum – Computer assisted learning (CAL) method	Explain the effect of drugs acting on the autonomic nervous system on smooth muscle of gastrointestinal tract		
10	P drug concept, individualization of drug therapy	1. Understand the concept of 'p' drug and 'p' list 2. Identify the general principles involved in making a 'p' list of drugs 3 Acquire the skills involved in choosing an appropriate drug regimen in patients with respect to his/her risk factors and disease characteristics.		
11	Fixed dose drug combinations .	1. List the criteria for acceptability of fixed dose drug combinations. 2. Enumerate the advantages and disadvantages of fixed dose drug formulations. 3. Critically analyse some commonly used formulations on the basis of the acceptable criteria for fixed - ratio drugs and argue the absence of scientific rationale in their use		

12	Essential medicines list	1. Define the concept of essential medicines and appreciate its importance. 2. Understand the relevance of an essential medicines list at various levels of health care. 3. List the guidelines for selection of essential medicines. 4. List data required for generation of essential medicines list 5. Prepare an essential medicines list for various levels of health care		
13	Prescription auditing – basic concepts	1. Identify the parts of a prescription and realize the importance of each. 2. Conduct a prescription audit and understand its importance in improving prescribing.		
14	Prescription writing – Basic concepts	1. Write a prescription in the correct format. 2. Understand the medico-legal importance of a prescription		
15	Drug interaction exercises	1. Understand the phenomena of drug interaction and anticipate their beneficial or harmful effect. 2. Critically analyse given drug interactions		
16	Pharmaco-vigilance	1. Definition & Importance of pharmacovigilance 2. Methods for detection and reporting of ADR	1. Causality assessment of ADR	1. Vigiflow and uploading of ADR reports
17	Pharmaco-economics	1. Definition of pharmacoeconomics 2. Choice of appropriate drug on the basis of pharmacoeconomic principles	1. Types of pharmacoeconomic analysis	
18	Sources of drug information	1. Types of sources of drug information 2. Identification of most appropriate source of drug information	1. Utilisation of internet based and smart-phone based sources of drug information	1. Paid sources of drug information

TEACHING-LEARNING METHODS

The teaching-learning methods would aim to make the students life-long learners of pharmacology and with the goal of making the student understand the concept of rational use of drugs.

The curriculum would be delivered through

1. Didactic Lectures
2. Interactive sessions
3. Tutorials
4. Practical
5. Computer simulations –CAL
6. Student Seminars
7. Group discussions
8. Integrated sessions

Recommended Textbooks

1. Basic & Clinical Pharmacology by Bertram G, Katzung
2. Clinical Pharmacology by DR Lawrence, PN Bennett & MJ Brown
3. Lippincott Illustrated Reviews: Pharmacology by Karen Whalen
4. Essentials of Medical Pharmacology by K.D. Tripathi
5. Principles of Pharmacology by HL Sharma and KK Sharma
6. Pharmacology for MBBS by SK Srivastava

ASSESSMENT

The core competencies would be assessed with the following assessment methods:

1. MCQ based theory paper
2. OSPE
3. Computer simulated Exercises
4. Prescription Writing
5. P-Drug selection

EXAMINATION AND MARKS DISTRIBUTION

Grand Total - 200
Internal Assessment - 100 (IA will contribute to 50% of the Grand total for both theory and practical)
Professional Examination -100

Theory marks distribution
Grand Total = 200, pass marks = 100

	Scheduled Assessment time	Actual marks in paper	Contribution to Grand Total
1st Internal assessment	Mid III semester examination (November)	50	25%
2nd Internal assessment	End III Semester examination(February)	50	25%
3rd Internal assessment	End IV Semester(July)	50	25%
4thInternal assessment (Paper I and Paper II) 40% of topics from IIIrd term 60% of topics from Ist & IInd term	Preliminary Examination (November)	100	25%
Final Professional Examination (Paper I and Paper II)	Final Professional Examination (December)	100	100%

Practical
Total marks = 100, Pass marks = 50

	Actual marks in practical	Contribution to Grand total
1st Internal assessment	50	25%
2nd Internal assessment	50	25%
3rd Internal assessment	50	25%
4thInternal assessment	50	25%
Final professional exam	50	100%

** The final marks should be rounded off to integers only at the stage of final totalling. At the time of rounding off, the rounding off should be done by standard method.