

1. SYLLABUS :

1.1 LEARNING METHODS

Lectures, tutorials, practicals, case studies, group discussions, seminars, integrated Teaching.

Distribution of Teaching Hours:

1.1.1 Theory

- Lectures - 108 ± 7
- Case studies, group discussions & seminars - 12 ± 5
- Total - 120 ± 12**

1.1.2 PRACTICALS & TUTORIALS - 120 ± 5

1.1.3 REVISION & EVALUATION (Internal Assessment) - 60

1.2 SEQUENTIAL ORGANISATION OF CONTENTS

The students are expected to study the drugs as given below:

(a) Essential Drugs that must be known	(b) Other Drugs that must be known	(c) Drugs that may be mainly required to be known for solving MCQs
<ul style="list-style-type: none">• Pharmacokinetics• Dosage schedule• Pharmacodynamics• Indications (Uses)• Contraindications• Drug interactions• Adverse effects	<ul style="list-style-type: none">• Mechanism of action• Therapeutic Uses• Important Adverse Effects (without dosage schedule, contraindications, drug interactions)	<ul style="list-style-type: none">• Classification of drugs

A) INTRODUCTION:

PHARMACOLOGY – (N=3)

- A FOUNDATION TO CLINICAL PRACTICE (n=1)
 - Development of the branch of pharmacology; Scope of the subject; role of drugs as one of the modalities to treat diseases,

- Definition of drug;
- Nature and sources of drugs;
- Subdivisions of pharmacology
- Rational pharmacotherapy
- **DRUG DEVELOPMENT** (n=1)
- **DRUG ASSAYS** (n=1)

B) GENERAL PHARMACOLOGY: (N=11 ± 2)

- Pharmacokinetics: Absorption, Distribution, Biotransformation, and Elimination (n=5) Pharmacodynamics: Principles of drug action, Mechanisms of drug action.
- Receptors (Nature, Types, Theories, Regulation) (n=1)
- Application to pharmacotherapeutics: Relevance of Pharmacokinetics & dynamics in clinical practice, Sequelae of repeated administration of drug (n=2)
- Factors modifying drug action (n=1)
- Adverse Drug Reactions (n=2)

C) AUTONOMIC PHARMACOLOGY: (N= 9 ± 2)

- General Considerations (n=1)
- Adrenergic agonists (n=2)

Adrenaline, Isoprenaline, Ephedrine, Dopamine	Dobutamine, Mephenteramine	Noradrenaline, Oxymetazoline,
Phenylephrine, Xylometazoline, Isoxsuprine	Ritodrine.	Amphetamine, Fenfluramine, Methoxamine.

- Adrenergic antagonists (n=2)

Prazosin, Propranolol, Timolol, Atenolol	Metoprolol	Phentolamine, Acebutalol, Labetalol
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- Cholinergic agonists & Anticholinesterases (n=2)

Pilocarpine, Neostigmine, Physostigmine, Pyridostigmine, Pralidoxime.	Acetylcholine, Bethanechol, Edrophonium.	Methacholine, Carbachol, DFP, Tik 20, Soman, Propoxur, Echothiophate, Tabun, Sarin, Parathion, Malathion.
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- Antimuscarinic drugs (n=1)

Atropine, Hyoscine butyl bromide, Homatropine, Ipratropium bromide, Tropicamide, Dicyclomine, Biperidine.	Glycopyrrolate, Pirenzepine, Benzhexol, Benztropine.	Cyclopentolate, Propantheline.
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Skeletal muscle relaxants (n=1) Succinylcholine, Vecuronium, Alcuronium, Pancuronium, Atracurium,	d-Tubocurarine	Dantrolene, Baclofen
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D) CARDIOVASCULAR SYSTEM INCLUDING DRUGSAFFECTING

**COAGULATION AND THOSE ACTING ON KIDNEYS:
(N=13 ± 2)**

- General Considerations & overview of antihypertensive therapy (n=1)
- Diuretics (n=2)

Frusemide, Hydrochlorothiazide, Acetazolamide, Mannitol, Spironolactone,	Chlorthalidone,	Triamterene, Amiloride.
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- Angiotensin Converting Enzyme (ACE) inhibitor & A II antagonists (n=1)

Enalapril	Captopril	Ramipril, Lisinopril, Losartan
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- Sympatholytics & vasodilators (n=1)

Methyldopa, Hydralazine, Sodium Nitroprusside.	Clonidine	Reserpine, Minoxidil
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- Antianginal Drugs (n=1)

Glyceryl Trinitrate, Isosorbide-5- Mononitrate, Isosorbide dinitrate		Nicorandil
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- Drugs affecting coagulation / thrombosis / bleeding (n=2) Coagulants

Vit. K (Phytomenadione), Factor VIII conc. & Factor IX complex		
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- Anticoagulants, Thrombolytics & Antiplatelet Agents

Heparin, Warfarin, Acenocumarol, Streptokinase.	Urokinase	Alteplase, Ticlopidine, Dipyridamol.
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- Drugs for CCF: Digitalis glycosides & Other agents (n=1)

Digoxin		Amrinone, Milrinone.
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- Antiarrhythmic Agents (n=1)

Quinidine, Procainamide, Mexiletin, Amiodarone		
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- Agents used for the management of shock (n=1)

- Plasma expanders, water and electrolyte balance (I.V Fluids)

Albumin, Dextran-70, polygelene, Glucose, Glucose + NaCl, Ringer Lactate, NaCl, KCL, Intraperitoneal Dialysis soln.	P.V.P.	
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- Hypolipidaemic drugs (n=1)

Lovastatin	Cholestyramine, Clofibrate, Probucol, Nicotinic Acid	
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E) HAEMATINICS AND HAEMATOPOIETIC FACTORS: (N=1)

Agents used in the therapy of iron deficiency and megaloblastic anaemia

Ferrous salt, Folic acid Ferrous salt + Folic acid, Folinic Acid, Iron Dextran	Iron Sorbitol Citric Acid	
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F) DRUGS AFFECTING C.N.S. (N=15 ± 2)

- Sedative-Hypnotics (n=1)

Diazepam, Clonazepam, Phenobarbitone, Chloralhydrate.	Alprazolam	Lorazepam
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- Psychopharmacology: (n=3)
- Antianxiety & Antimanic

Lithium		Buspirone
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- Antipsychotics:

Chlorpromazine, Flufenazine, Haloperidol.		
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- Antidepressants:

Amitriptyline, Imipramine, Clomipramine, Fluoxetine,		Citalopram, Sertraline
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- Antiepileptics (n=2)

Carbamazepine, Sodium Valproate, Phenytoin Sodium		Ethosuximide,
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- Anti-Parkinsonian agents (n=1)

Levodopa- Carbidopa, Trihexiphenidyl	Selegiline	Bromocriptin e, Amantadine
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- Local anaesthetics (n=1)

Lignocaine, Bupivacaine, Lignocaine + Adrenaline, Tetracaine.	Procaine	
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- General anaesthetics (n=1)

Thiopental Sodium, Ether, Halothane, Ketamine, NitrousOxide	Isofluran e, Fentanyl	Lorazepam, Propofol
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- Analgesics: (n=3)
Opioids &
NSAIDs:

Morphine, Pethidine, Codeine, Naloxone, Pentazocine		Methadone, Naltrexone
Acetyl Salicylic Acid, Ibuprofen, Paracetamol, Diclofenac,	Piroxicam, Ketorolac, Nimesulid e	Flurbiprofe n, Celecoxib

- Pharmacotherapy of rheumatoid arthritis and gout (n=1)

Allopurinol, Colchicine,	Probenecid	d-penicillamine
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- Substance abuse: Management of opioid, alcohol & tobacco addictions n=1
- Alcohol (n=1)

Ethyl Alcohol (70 %)		Disulfiram
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G) MISCELLANEOUS TOPICS - I: (N=7 ± 2) Autacoids (to be covered before pain lectures)

- Drug treatment of migraine (n=1)
- Ergot, serotonin. (n=1)

Ergotamine, Dihydroergotamine, Methylergometrine	Ondansetro n, Sumatriptan	Cyproheptadine
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- Antihistaminics (n=1)

Chlorpheniramine, Promethazine, Pheniramine	Loratadine, Cetirizine, Diphenhydrami ne	Meclizine, Cyclizine, Cinnarizine.
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- Drugs acting on the uterus (n=1)

Oxytocin		Ethacridin e, Magnesiu m
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DRUGS ACTING ON IMMUNE SYSTEM:

- Immunostimulants, immunosuppressants; pharmacology of vaccines & sera (n=1)

Cyclosporine Tuberculin purified protein derivative Vaccines- Typhoid (TAB), Pertussis, Meningococcal, Influenza, B.C.G., A.R.V. (Semple), Hepatitis B, O.P.V., Mumps, Measles, Rubella, Tetanus toxoid, D.P.T. Immunoglobulin Anti tetanus Ig, Rabies Ig, Anti-D-Ig, Ig Human Normal, Anti Snake Venom, Diphtheria Anti toxin,	P.C.E.V. H.D.C.V.	M.M.R. P.V.R.V I.P.V (Salk's Vaccine) Hepatitis A Typhoid-Ty 21a Anti Gas Gangrene Serum
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RESPIRATORY SYSTEM

- Drugs used for bronchial asthma (n=1)

Salbutamol, Terbutaline, Aminophylline, Theophylline, Sodium Cromoglycate, Beclomethasone		Leukotriene Inhibitors (Zafirlukast, Montelukast), Salmeterol, Budesonide
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- Pharmacotherapy of cough (n=1)

Dextromethorphan,	Ammonium Salts, Bromhexine	Ambroxol, Acetylcystin e, Codeine
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- Therapeutic
 Gases Oxygen

H) CHEMOTHERAPY INCLUDING CANCER

CHEMOTHERAPY: (N=21 ± 2)

- General considerations (n=2)
- Antimicrobial agents (n=8)
- Sulphonamides & Cotrimoxazole

Sulfadiazine, Sulfacetamide, Silver Sulfadiazine, Trimethopri m, Cotrimoxazol e	Sulfamethoxazol e	Sufadoxine
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- Quinolone derivatives

Nalidixic Acid, Ciprofloxacin, Ofloxacin, Norfloxacin, Levofloxacin		Pefloxacin, Gatifloxaci n, Sparfloxaci n
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- Lactams Penicillins

Benzyl penicillin, Benzathine penicillin G, Phenoxy methyl penicillin, Procaine penicillin G, Cloxacillin, Ampicillin Amoxycillin, Amoxycillin + Clavulanic Acid.	Carbenicillin, Methicillin, Sulbactam	Mecillinam, Ticarcillin, Piperacillin, Mezlocillin.
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- Cephalosporins

Ceftazidime, Ceftriaxone, Cephalexin	Cefotaxime, Cefadroxil.	Cefepime. Other β -Lactams (Imipenem + Cilastatin),
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- Aminoglycosides

Streptomycin, Gentamicin, Kanamycin, Amikacin, Neomycin, Framycetin		
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Neomycin + Bacitracin		
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- Macrolides

Erythromycin	Roxithromycin, Azithromycin, Clarithromycin	Miscellaneous Antibiotics Clindamycin, Vancomycin
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- Tetracyclines & Chloramphenicol

Tetracycline, Doxycycline, Chloramphenicol		Minocycline, Demeclocycline.
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Urinary antiseptics		Nitrofurantoin, Methanamine
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- Anti-Tuberculosis agents; Anti-leprotic agents (n=3)

Isoniazid (H), Rifampicin (R), Pyrazinamide (Z), Ethambutol (E), H+ E, H+ R, H + R + Z, H + R + Z + E		Rifabutin, Thiacetazone + Isoniazid Ethionamide
Dapsone, Clofazimine		Minocycline

- Antiprotozoal agents: (n=3)

Antiamoebic & Other
antiprotozoal

Metronidazole, Diloxanide furoate, Tinidazole, Furazolidone,	Sodium Stibogluconate, Pentamidine	Secnidazole
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- Antimalarials

Chloroquine, Mefloquine, Quinine, Primaquine, Pyrimethamine+Sulfadoxine	Artemether, Artesunate, Artesunate + Lumifantrine	Proguanil, Halofantrine.
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- Anthelmintics (n=1)

Mebendazole, Albendazole, Pyrantel pamoate, Diethylcarbamazine, Niclosamide, Praziquantel		Thiabendazole, Ivermectin, Levamisole, Piperazine.
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- Antifungal agents (n=1)

Amphotericin-B, Nystatin, Griseofulvin, Ketoconazole, Miconazole, Fluconazole, Flucytosine		Tolnaftate
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- Antiviral agents including antiretroviral agents (n=1)

Acyclovir, Zidovudine, Idoxuridine	Didanosine	Lamivudine, Abacavir, Nevirapine, Ritonavir, Indinavir, Saquinavir, Nelfinavir, Efavirenz, Lopinavir + ritonavir, Interferon
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- Pharmacotherapy of STDs (n=1)

- Principles of cancer chemotherapy and their adverse drug reactions (n=1)(individual agents and regimes need not be taught)

	Cyclophosphamide, Methotrexate, Vincristine, Vinblastine, Actinomycin D	Mechlorethamine, Chlorambucil, Melphalan, Dacarbazine, 6-Mercaptopurine, Azathioprine, Flurouracil, Cytosine arabinocide, Etoposide, Doxorubicin, Daunorubicin, Bleomycin, Procarbazine, Mitomycin C, Cisplatin, L- Asparaginase.
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I) ENDOCRINOLOGY: (N=11 ± 2)

• Corticosteroids (n=2)

Hydrocortisone, Hydrocortisone sodium succinate, Prednisolone, Methyl- prednisolone, Dexamethasone , Betamethasone , Fludrocortison e.		
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• Oestrogens & its antagonists (n=1)

Ethinyl-estradiol, Centchroma n, Tamoxifen.	Stilbestrol	
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• Progestins & their antagonists (n=1)

Medroxyprogesterone acetate, Norethisterone enanthate, Norethisterone, Levonorgestrel		Norgestrel
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• Contraceptives & Ovulation inducing agents (n=1)

Ethinyl-estradiol +Levonorgestrel, Ethinyl- estradiol+Norethisterone, Ethinyl-estradiol + Norgestrel, I.U.C.D with Copper		Clomiphene Citrate
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• Testosterone & anabolic steroids (n=1)

Testosterone propionate, Danazol		Nandrolone, Finasteride
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Thyroid

• Thyroxine and antithyroid agents (n=2)

Levothyroxine, Propylthiouracil, Carbamezole, Potassium iodide, Iodine,		Methimazole, Radioactive iodine
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- Agents affecting calcium balance (n=1)

D3 (Ergocalciferol), Calcium Salt,		Calcitonin

ANTIDIABETIC AGENTS:

- Insulin; Oral antidiabetic drugs (n=2)

Insulin Injection, Lente/NPH Insulin, Gliben-clamide, Metformin		New Preparations (Insulin), Chlorpropamide, Acarbose, Ripaglinide, Roglitazone
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J) AGENTS USED IN GASTROINTESTINAL DISORDERS:(N=5 ± 1)

- Pharmacotherapy of nausea & vomiting (n=1)

Metoclopramide, Domperidon e, Prochlorperazine,		Ondansetron, Cisapride, Ipecacuanha
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- Pharmacotherapy of peptic ulcer (n=2)

Cimetidine, Ranitidine, Aluminum hydroxide +Magnesium hydroxide	Omeprazole, Sucralfate, Misoprostol	Colloidal Bismuth, Carbenoxolon eSodium
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Anti-haemorrhoidal agents- (Local anaesthetic, Astringent & Anti-inflammatory)

Management of Diarrhea and Constipation (n=2)

- Antidiarrheal

O.R.S, Sodium hydrogen carbonate, Sulfasalazine, 5-Amino Salicylic acid, Loperamide	Diphenoxylate	
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- Laxatives

Senna, Magnesium hydroxide, Bisacodyl, Ispaghula, Liquid paraffin, Castor oil		Magnesium Trisilicate, Cascara sagrada, Lactulose, DOSS
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K) MISCELLANEOUS TOPICS – II (N=8 ± 1)

- Drug-Drug Interactions (n=1)
- Drug use at extremes of age, in pregnancy & in organ dysfunction(n=2)
- Use of chelating agents in heavy metal poisonings (n=1)

Dimercaprol (B.A.L.), Calciumdisodium edetate, Desferrioxamine, Activated charcoal	d-Penicillamine, N-acetylcysteine.	Deferiprone
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- Ocular pharmacology (n=1)
- Dermato-pharmacology (n=1)

Glycerin, Calamine, Silver nitrate, Podophyllum resin, Benzoin compound, Selenium sulfide, Coaltar, Benzoyl peroxide, Benzyl benzoate, Permethrin, Gamma benzene hexachloride		
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- Diagnostic Agents

Fluorescein		
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- Vitamins (n=1)

Retinol, Conc. Vit A sol., Thiamine, Riboflavin, Nicotinamide, Pyridoxine, B12, Ascorbic Acid, Hydroxocobalamine, Vitamin B complex & Multi vitamins as per Schedule V	Vitamin E	
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- Antiseptics and disinfectants (n=1)

Povidone iodine, Cetrimide, Potassium permanganate, Bleaching powder, Chlorhexidine, Glutaraldehyde, Formaldehyde, Chloroxylenol, Hydrogen Peroxide, Gentian Violet, Acriflavin +Glycerine		
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L) RATIONAL PHARMACOTHERAPY:

(N=4) Prescription writing and P-drug concept Rational Drug Use; Essential Drug List (EDL)

CRITICISM WITH REFERENCE TO FIXED DRUG COMBINATIONS (FDCS)

1.3 TERM-WISE

DISTRIBUTION I TERM

- Introduction
- General pharmacology
- Autonomic pharmacology
- Endocrinology
- **Research methodology (10 sessions in II MBBS)**
- **Communication skill (5 sessions in II MBBS)**
- **Language sessions (5 sessions in II**

MBBS) II TERM

Chemotherapy
Central Nervous System

III TERM

Agents used in gastro-intestinal disorders
Drugs acting on cardiovascular system including drugs affecting coagulation and those acting on the kidneys
MISCELLANEOUS (including RS.)

BIO-ETHICS IN UNDERGRADUATE MEDICAL CURRICULUM(4 +10)

Sr. No.	Theory Topic	Department	Hours
1	Informed consent and assent	Pharmacology	02 Hours
2	Research Ethics	Pharmacology	02 Hours

HORIZONTAL INTEGRATED TEACHING

Sr. No.	Semester of MBBS	Topics to be covered
1	III rd Semester	1. Pyelonephritis 2. Pneumonia 3. Enteric Fever
2	IV th Semester	4. TB 5. HIV

3	Vth Semester	6. Myocardial infraction 7. Malaria
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1.4 PRACTICALS & TUTORIALS: TOTAL HOURS, NUMBER AND CONTENTS

Total hours :

120 Number :

60 Contents :

I TERM PRACTICALS (N=10)

Introduction to Practical Pharmacology, animal study and drug development, Assay (Computer simulated), Effect of drug on blood pressure and respiration (Computer simulated), Neuromuscular signal transmission (Computer simulated), Mydriatic and miotics (Computer simulated), Effect of drug on ciliary motility of frogs oesophagus (Computer simulated), Study of drug antagonism (Computer simulated), Case studies: Diabetes Mellitus and Organophosphorus poisoning. Dissolution and disintegration, Introduction to Pharmacopoeia. Printed material.

- **ROUTES OF DRUG ADMINISTRATION:**

Demonstration using mannequin-

- Intravenous
- Intramuscular
- Subcutaneous
- Intradermal
- Inhalation

- **DIABETES MELLITUS-**

Estimation of blood glucose level by glucometer Use of insulin pen Taking out insulin from a syringe into a vial

II TERM PRACTICALS (N=30)

Pharmacy: Prescription Writing, Clinical Prescription Writing, Evaluation of analgesics (Computer simulated), Clinical evaluation, Visit to pharmaceutical company, Clinical trials, Study of drug utilisation pattern in hospitals, Case studies: Methanol poisoning, with standard prescription, Printed material

III TERM PRACTICALS (N=20)

Effect of nitrate on volunteers, Problem solving, Adverse Drug Reactions, Comments on the FDCs, Case studies: - Bronchial Asthma, Hypertension, Diarrhoea, Anaemia, Skin, Drug interaction - book information, Printed material. The journal should be scrutinized by the teacher concerned and presented during university examination.

1.5 BOOKS RECOMMENDED

- 4.5.1. Pharmacology & Pharmacotherapeutics. Satoskar R.S., Bhandarkar SD(Ed), Publisher: Popular Prakashan, Bombay.
- 4.5.2 Essentials of Medical Pharmacology. Tripathi K.D. (Ed), JaypeeBrothers, publisher: Medical Publishers (P) Ltd.
- 4.5.3 Clinical Pharmacology. Laurence DR, Bennet PN, Brown MJ (Ed).Publisher: Churchill Livingstone

1.6 REFERENCE BOOKS :

- 1.6.1 Basic & Clinical Pharmacology. Katzung BG (Ed), Publisher: PrenticeHall International Ltd., London
- 1.6.2 Goodman & Gilman's The Pharmacological Basis of Therapeutics. Hardman JG & Limbird LE (Ed), Publisher: McGraw-Hill, New York
- 1.6.3 Pharmacology: H. P. Rang, M. M. Dale, J.M. Ritter publisher: Churchill Livingstone.

MAPPING OF PROGRAMME OUTCOMES [POs] AND COURSE OUTCOMES [COs] OF- II - MBBS PROGRAMMES

PROGRAMME OUTCOMES :

Programme Name: MBBS	
Subject Code: 01010203	
Sr. No.	By the end of the programme, the MBBS Graduate will have /be:
PO 1	Knowledge and Skills
PO 2	Planning and problem-solving abilities
PO 3	Communication
PO 4	Research Aptitude
PO 5	Professionalism and Ethics
PO 6	Leadership
PO 7	Societal Responsibilities
PO 8	Environment and Sustainability
PO 9	Lifelong Learner

Year II	
Course Code	Course Title
01010201	Pathology
01010203	Pharmacology and Therapeutics
01010202	Microbiology
01010304	Forensic Medicine and Toxicology

Pharmacology and Therapeutics : (01010203)		
CO No.	At the end of the course, the learner should be able to:	Mapped Programme Outcomes
CO 1	Describe the pharmacokinetics and pharmacodynamics of essential and commonly used drugs	PO1,PO2,PO3, PO4,PO5,PO9
CO 2	Explain indications and contraindications, drug interactions, adverse drug reactions, efficacy and safety of essential & commonly used drugs and their use in special situations such as pregnancy, lactation, infancy and old age	PO1,PO2,PO3, PO4,PO5,PO6, PO7,PO9
CO 3	State the principles underlying the concept of 'essential drugs' i.e. selection of essential drugs from adequate data based on safety and efficacy as determined by clinical studies	PO1,PO2,PO3, PO4,PO5,PO6, PO7,PO9
CO 4	Rational prescription writing	PO1,PO2,PO3, PO4,PO5,PO6, PO7,PO9
CO 5	Identify ADR & Drug interactions	PO1,PO2,PO3, PO4,PO5,PO6, PO7,PO9
CO 6	Interpret the data of experiments designed for study of effects of drugs	PO1,PO2, PO3,PO5,PO6, PO7,PO9
CO 7	Critically evaluate the drug formulations	PO1,PO2,PO3, PO4,PO5,PO6, PO7,PO9

