

# **Pharmacology & Therapeutics**

## **DEPARTMENTAL OBJECTIVES:**

The objective is to provide a need based integrated ‘Basic Pharmacology for a safe and effective prescribing’ Course so that the students on graduation will be competent to:

- Describe the pharmacological effects, mechanisms of action, pharmacokinetic characteristics and adverse reactions of drugs in order to be able to prescribe safely and effectively.
- describe the basic principles and concepts considered essential for rational (effective, safe, suitable and economic) prescribing and use of medicines in clinical practice.
- understand the principles of rational prescribing and the basis of utilizing the principles of rational evaluation of therapeutic alternatives.
- Recognize, manage and report the adverse drug reactions (ADRs) and drug interactions.
- Obtain informed consent by providing enough information about disease(s), treatment(s) and alternative options available, in order to allow the patient to make informed decision about their treatment.
- identify and assess objectively the drug information sources.
- state the Essential Drug List and principles underlying the ‘Concept of Essential Drugs’, and apply them in community oriented health care delivery service.
- recognize the implications of poly pharmacy and other means of irrational prescribing, identify influences favouring irrational prescribing and develop means to resist them.
- evaluate the ethical and legal issues involved in drug prescribing, development, manufacture and marketing.
- acquire methods of learning needed for evaluation of existing and new drugs and to follow trends and approaches in pharmacological research.
- develop attitude for continuous self learning and professional development throughout their practicing life.

## **Competencies related to Pharmacology to be acquired by the graduates-**

### **A) Knowledge and Understanding**

- Basic pharmacodynamics (effects, mechanism), and clinical pharmacokinetics required for safe and effective prescribing.
- Adverse Drug Reactions (ADRs): recognizing, management & reporting
- Basic principles & concepts essential for rational (effective, safe, suitable and economic) prescribing and use of drugs in clinical practice.
- Concept of essential drugs and selection of essential drug list for use in community oriented health care services.
- Drug information sources: access to unbiased drug compendia and use of standard treatment guidelines , formularies to support safe and effective prescribing
- Ethics of Prescribing: Informed patient consent about disease, treatment given and alternative options available.
- The ethical and legal issues involved in drug prescribing, development and marketing.

### **B) Skill –**

- Taking drug history.
- Prescription writing: choosing safe & effective drugs and appropriate dosage formulations.
- Selecting appropriate drugs (P Drug) to support rational prescribing considering efficacy, safety, suaiability and cost.
- Recognizing, managing and reporting Adverse Drug Reactions (ADRs) and drug interactions.
- Obtaining accurate objective information to support safe and effective prescribing.
- Prescribing drugs for special groups: elderly, children, pregnancy, breast feeding mothers, renal &/or hepatic impairment or failure.
- Getting informed consent from patients
- Analyzing new evidence:
  - Reading, assessing and critically analyzing clinical trial results
  - Practicing evidence based medicine
  - Assessing the possible benefits and hazards of new therapy

### **C) Attitude –**

- Continuous self learning to keep their knowledge & skill up to date through continuous professional development.
- Communicating with patients regarding disease, the drug treatment and alternative options to obtain informed consent and respecting patients' own views and wishes in relation to drug treatment.

## Distribution of teaching - learning hours

| Lecture   | Tutorial | Practical and Demonstration | Clinical Case Report | Total teaching hours | Formative Exam    |           | Summative exam    |           |
|---|----------|-----------------------------|----------------------|----------------------|-------------------|-----------|-------------------|-----------|
|   |          |                             |                      |                      | Preparatory leave | Exam time | Preparatory leave | Exam time |
| 100 hrs   | 30 hrs   | 50 hrs                      | 20 hrs               | 200 hrs              | 10 days           | 15 days   | 10 days           | 15 days   |
| <i>(Time for exam. preparatory leave and formative &amp; summative assessment is common for all subjects of the phase )</i> |          |                             |                      |                      |                   |           |                   |           |

## Teaching-learning methods, teaching aids and evaluation

| Teaching Methods |  |               |   | Teaching aids  | In course evaluation  |
|------------------|--|---------------|---|--|---|
| Large group      | Small group                            | Self learning | Others  |  |   |
| Lecture          | Tutorial<br>Practical & Demonstrations | Assignment    | Integrated teaching/Assignment with presentation, clinical case report<br>Block Placement at the end of term II | Laptop multimedia<br>Microphone, Speaker<br>Overhead Projector With Screen, Laser Pointer, Slide Projector, Black Board, White Board, Marker, Duster<br>Tracing paper showing drug effect, reference books | <ul style="list-style-type: none"> <li>• Item Examination</li> <li>• Card final (written)</li> <li>• Term Examination</li> <li>• Term final (written, oral+ practical)</li> </ul> |

### 3<sup>rd</sup> Professional Examination:

#### Marks distribution of Assessment of Pharmacology & Therapeutics:

#### Total marks – 300

- Written = 90 (MCQ-20, SAQ-70) + formative assessment marks -10= 100
- Structured oral examination= 100
- Practical (Traditional + OSPE) =100

## Term I

| Learning Objectives   | Core Contents   | Teaching-Learning Strategies                         | Teaching Hours | * Evaluations                              |
|---|---|--|----------------|--|
| <p><b>A. GENERAL PRINCIPLES OF PHARMACOLOGY</b></p> <p>At the end of the course students shall be able to:</p> <ul style="list-style-type: none"> <li>• describe the role and scope of pharmacology</li> <li>• understand the principles of drug disposition (kinetics)-absorption, distribution, metabolism and excretion</li> <li>• understand the basic principles related to cellular and molecular aspects of drug action (dynamics), selectivity, specificity and quantitative aspects of drug action</li> <li>• recognize adverse drug reactions, interactions and problems of drug misuse and abuse</li> <li>• describe the ethical, legal and economic aspects of prescription writing and compliance</li> </ul> | <p><b>A. GENERAL PRINCIPLES OF PHARMACOLOGY</b></p> <p><b>LECTURES:</b></p> <p>01: <b>Introducing Pharmacology</b></p> <p>02: <b>Drug Administration</b><br/>Routes, drug delivery and<br/>Formulations for local &amp; systemic effects</p> <p>03: <b>Drug Absorption</b><br/>Transfer of drugs across cell membrane &amp;<br/>specialized barriers, Factors influencing absorption</p> <p>04: <b>Bio-availability</b><br/>Studies to compare bio-equivalence<br/>&amp; to monitor therapy</p> <p>05: <b>Drug Distribution</b><br/><math>V_d</math>, Plasma protein &amp; tissue binding, redistribution</p> <p>06: <b>Drug Metabolism</b><br/>Where, why and how of bio-transformation, hepatic microsomal enzymes- induction &amp; inhibition<br/>Genetic influence on Drug metabolism (Pharmacogenetics)</p> <p>07: <b>Drug Elimination</b><br/>Routes, Renal Excretion &amp; Factors influencing renal excretion</p> | Lectures/<br>Practical/<br>Tutorials/<br>Assignments | 15 hrs         | Three item<br>Examinations<br>(Item 1,2,3) |

| Learning Objectives | Core Contents  | Teaching-Learning Strategies | Teaching Hours | * Evaluations |
|---------------------|--|------------------------------|----------------|---------------|
|                     | <p><b>08: Clinical Pharmacokinetics</b><br/> <math>V_d</math>, Cl, First &amp; Zero order kinetics of Elimination, <math>t_{1/2}</math>, Steady state concentration, loading dose &amp; maintenance dose</p> <p><b>09: Dynamics: How do drugs act?</b><br/>     Receptor-effectors linkages</p> <p><b>10: Quantitative aspects of drug action</b><br/>     Dose-response relationships &amp; curves<br/>     Information obtained from D-R curves:<br/>     Agonists – efficacy, potency, shift of curves<br/>     Antagonists -</p> <p><b>11: Individual variations in drug responses</b></p> <p><b>12: Drug safety and vigilance</b><br/>     Adverse drug reactions:<br/>     Types, detecting &amp; managing ADR<br/>     ADR monitoring &amp; reporting</p> |                              |                |               |

| Learning Objectives  | Core Contents   | Teaching-Learning Strategies                          | Teaching Hours | * Evaluations                    |
|--|---|---|----------------|----------------------------------|
| <p><b>B. AUTONOMIC PHARMACOLOGY</b></p> <p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> <li>▪ understand the organization of autonomic nervous system, physiology of neuro-chemical transmission, co-transmission and their pre and post synaptic modulation</li> <li>▪ understand the physiology of cholinergic neurotransmission, classify the cholinoreceptors and identify the drugs affecting cholinergic transmission and cholinoreceptors</li> </ul> | <p><b>B. AUTONOMIC PHARMACOLOGY</b></p> <p><b>LECTURES:</b></p> <p><b>01: Introduction</b><br/>Organization of ANS – sympathetic, parasympathetic, and enteric NS<br/>Transmitters in ANS (ACh, NA, NANCs)<br/>Co-transmission, pre and postsynaptic modulation<br/>Cholinergic neurotransmission &amp; drugs modifying the events, Cholinergic receptors</p> <p><b>02: Cholinergic Drugs</b><br/>Effects of the stimulation of Cholinoreceptors<br/>Classification of cholinergic drugs – cholinoreceptor agonists and anti-cholinesterase</p> <p><b>03: Drugs for Glaucoma</b><br/>Role of Cholinergic drugs compared to other drugs</p> <p><b>04: OPC insecticide poisoning</b><br/>Manifestation &amp; management</p> <p><b>05: Anti-cholinergic Anti-muscarinic</b><br/>Atropine and atropine substitute</p> <p><b>06: Anti-cholinergic anti-nicotinic</b><br/>Classification – Neuromuscular blockers &amp; their role as skeletal muscle relaxant during anaesthesia Ganglion blocker (names only)</p> | Lectures/<br>Practicals/<br>Tutorials/<br>Assignments | <b>12 hrs</b>  | Two item Examinations (Item 4,5) |

| Learning Objectives | Core Contents  | Teaching-Learning Strategies | Teaching Hours | * Evaluations |
|---------------------|--|------------------------------|----------------|---------------|
|                     | <p><b>07: Adrenergic neurotransmission</b><br/>           Drugs modifying the events<br/>           Adrenergic receptors<br/>           Effects of stimulation of adrenoceptors</p> <p><b>08: Adrenergic Drugs:</b><br/>           Classification<br/>           Adrenergic inotropic agents &amp;their role in therapy<br/>           Role of Adrenaline, Noradrenaline, Isoprenaline, Dopamine, &amp; Dobutamine in therapy<br/>           Adrenergic vasoconstrictors, nasal decongestants</p> <p><b>09: Selective <math>\beta_2</math> agonists as Bronchodilators</b>, compared to other Drugs used in asthma</p> <p><b>10: <math>\alpha</math>-adrenoceptor antagonist</b><br/>           Role of selective <math>\alpha_1</math> antagonist in therapy</p> <p><b>11: <math>\beta</math> adrenoceptor antagonist</b><br/>           Role of <math>\beta</math> blockers in therapy</p> |                              |                |               |

| Learning Objectives   | Core-Content   | Teaching-Learning Strategies       | Teaching Hours | * Evaluations                     |
|---|--|------------------------------------|----------------|-----------------------------------|
| <p><b>RENAL &amp; CARDIOVASCULAR PHARMACOLOGY</b></p> <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>Classify or list drugs which affect the Cardiovascular System</li> <li>Identify their pharmacological effects</li> <li>Interprete mechanisms of actions, kinetics and toxicity</li> <li>Correlate these knowledge to form the basis for their rational use in a given clinical situation</li> </ul> | <p><b>Renal &amp; Cardiovascular Pharmacology Lectures :</b></p> <p>01: <b>Diuretics</b><br/>Classification of diuretics: based on sites &amp; mechanism of action and efficacy<br/>Pharmacology of Thiazides, Loop, Potassium sparing diuretics: their role in therapy edema and hypertension</p> <p>02: <b>Drugs used in hypertension</b><br/>Epidemiology and pathophysiology of hypertension, Objectives of anti-hypertensive therapy, Classification of anti-hypertensive drugs.<br/>Pharmacology of Diuretics, <math>\beta</math> blockers, Ca channel blockers, ACE inhibitors, Angiotensin receptor antagonists, <math>\alpha</math> blockers, <math>\alpha</math> methyl dopa, Vasodilaotrs<br/>Principles of selection of drug in different clinical situations</p> <p>03: <b>Drugs used in congestive cardiac failure</b><br/>Pathophysiology of heart failure<br/>Objectives of therapy<br/>Drugs used in CCF: Diuretics, ACE inhibitors &amp; ARBs, Selective <math>\beta</math>-blockers, (Additional) Cardiac glycosides, vasodilators, Phosphodiesterase inhibitors.</p> <p>04: <b>Antianginal drugs</b><br/>Pathophysiology of angina, Objectives of therapy<br/>Drugs used in angina: Nitrates, <math>\square</math> blockers, <math>\text{Ca}^{2+}</math> channel blockers.<br/>Additional: <b><u>Antiarrhythmic Drugs</u></b><br/>Pathophysiology of arrhythmia<br/>Pharmacology of antiarrhythmic drugs</p> | Lecture/Tutorial/Class Assignments | 8 hrs          | Two item Examinations (Item 6, 7) |

| Learning Objectives   | Core Contents  | Teaching-Learning Strategies                  | Teaching Hours | * Evaluations                       |
|---|--|---|----------------|-------------------------------------|
| <p><b>HEMATOPOIETIC PHARMACOLOGY</b></p> <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>Classify or list drugs which affect the hematopoietic system</li> <li>Identify their pharmacological effects</li> <li>Interprete mechanisms of actions, kinetics and toxicity</li> <li>Correlate these knowledge to form the basis for their rational use in a given clinical situation</li> </ul> | <p><b>HEMATOPOIETIC PHARMACOLOGY</b></p> <p><b>LECTURES:</b></p> <p>01: <b>Anticoagulants &amp; Thrombolitics</b><br/>Pathophysiology of thrombo-embolism<br/>Pharmacology of Anti-coagulants: Heparin and LMW heparin, warfarin.<br/>Pharmacology of thrombolytics:<br/>Streptokinase, Alteplase, Reteplase etc.</p> <p>02: <b>Antiplatelet drugs</b><br/>Pharmacology of low dose aspirin, clopidogrel, glycoprotein IIb/IIIa inhibitors and their role in therapy</p> <p>03: <b>Lipid regulating drugs</b><br/>Pharmacology of statins, fibrates, nicotinic acid, resins etc.</p> <p>04: <b>Drugs for anaemia</b><br/>Pathophysiology of anaemia<br/>Pharmacology of hemopoeitics<br/>iron, folic acid, vit B<sub>12</sub><br/>Pharmacology of erythropoietin</p> <p><b>ADDITIONAL CONTENTS</b></p> | Lecture/<br>Tutorial/<br>Class<br>Assignments | <b>7 hrs</b>   | One item<br>Examination<br>(Item 8) |

| Learning Objectives  | Core Contents  | Teaching-Learning Strategies                          | Teaching Hours | * Evaluations                    |
|--|--|---|----------------|----------------------------------|
| <p><b>ENDOCRINE PHARMACOLOGY</b><br/> At the end of the session the students will be able to:</p> <ul style="list-style-type: none"> <li>▪ understand the physiology of endocrine and metabolic systems</li> <li>• list the pancreatic islet hormones and understand their role in the control of blood glucose; define and classify diabetes; understand the diagnostic criteria and monitoring tests and describe the pharmacology of insulin and oral antidiabetic drugs.</li> <li>• list and describe the physiology of adrenocortical hormones. Identify the synthesis inhibitors &amp; their role in therapy; describe the pharmacology of adrenocorticosteroids to assess their role in therapy as anti-inflammatory and immunosuppressive drugs</li> </ul> | <p><b>Endocrine Pharmacology</b></p> <p><b>LECTURES:</b></p> <p><b>01: Endocrine Pancreas and control of blood glucose</b><br/> Islet hormones, control of blood glucose<br/> Diabetes mellitus – types, diagnostic criteria, monitoring<br/> Insulin &amp; preparations<br/> Oral Hypoglycemic agents<br/> Hypoglycemic reactions &amp; management</p> <p><b>02: Adrenal cortex and drugs used in therapy</b><br/> Adrenocortical hormones: synthesis &amp; blockers;<br/> Control of secretion, mechanism of action<br/> Pharmacological actions, uses and preparations<br/> Adverse effects</p> <p><b>03: Reproductive system</b><br/> Hormonal control of female reproductive system<br/> Estrogens &amp; anti-estrogens<br/> Progesterone &amp; anti-progesterone<br/> Hormone replacement therapy<br/> Drugs used for contraception</p> <p><b>04: The Uterus</b><br/> Drugs that stimulate uterine contraction (oxytocics)<br/> Drugs that inhibit uterine contraction</p> <p><b>05: The Thyroid</b><br/> Synthesis, storage &amp; secretion of thyroid hormones<br/> Thyroid functions &amp; regulations<br/> Abnormalities of thyroid function<br/> Drugs used in disease of thyroid</p> | Lectures/<br>Practicals/<br>Tutorials/<br>Assignments | <b>9 hrs</b>   | One item Examination<br>(Item 9) |

| Learning Objectives   | Core Contents   | Teaching-Learning Strategies              | Teaching Hours | * Evaluations                  |
|---|---|---|----------------|--------------------------------|
| <p><b>GASTROINTESTINAL PHARMACOLOGY</b></p> <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• Classify or list the drugs affecting GIT</li> <li>• Identify pharmacological effects of the drugs</li> <li>• Interpret the mechanism of action, kinetics of the drugs and their toxicity</li> <li>• Correlate the gained knowledge to form the basis for rational use of medicines in a given clinical situation</li> </ul> | <p><b>Gastrointestinal Pharmacology LECTURES</b></p> <p><b>01: Drugs used in Peptic ulcer</b><br/>Pathophysiology of peptic ulcer<br/>Therapeutic goal and approach<br/>Antacids, H<sub>2</sub>- blockers, Proton pump inhibitors, gastric cytoprotective agents, Helicobactor pylori eradication regimen Gastroprolinctic drugs and other agents</p> <p><b>02: Drugs to treat diarrhoea</b><br/>Epidemiology, Principles of management Fluid and electrolyte replacement Selection of route and preparations<br/>ORS and different IV fluids<br/>Role of Antimicrobial drugs<br/>Antimotility drugs</p> <p><b>03: Drugs used in helminthiasis</b></p> <p><b>04: Laxatives</b></p> <p><b>05: Drugs for Inflammatory Bowel Diseases (IBS) &amp; Irritable Bowel Syndrome (IBS)</b></p> | Lecture/<br>Tutorial/<br>Class Assignment | 7 hrs          | One item Examination (Item 10) |

## Term II

| LEARNING OBJECTIVES   | Core Contents  | Teaching-Learning Strategies               | Teaching Hours | * Evaluations                             |
|---|--|--|----------------|---|
| <b>PHARMACOLOGY OF DRUGS ACTING ON CNS</b><br>Students will be able to: <ul style="list-style-type: none"> <li>• Classify or list of drugs acting on Central Nervous System</li> <li>• Explain the mechanisms of action, kinetics and toxicity of these drugs</li> <li>• Describe the uses, administration, adverse effects &amp; precautions of drugs used in diseases of CNS</li> </ul> | <p><b>Central Nervous System</b></p> <p><b>LECTURES:</b></p> <p><b>01:Introduction to CNS Drugs</b><br/>Neurotransmitters of CNS (distribution, ion channel) general characteristics of CNS drugs</p> <p><b>02: Opioid analgesic</b><br/>Pathophysiology of pain, Pain pathway, endogenous opioids and opioid receptors<br/>Opioids: morphine, codeine, pethidine, tramadol, fentanyl used as analgesics compared.<br/>Role of morphine in myocardial infarction and pulmonary edema.<br/>Other clinical uses of opioids</p> <p><b>03: Anxiolytics and hypnotics</b><br/>Pathophysiology of sleep<br/>Benzodiazepines and other non-BDZ sedative-hypnotics<br/>Centrally acting muscle relaxants</p> <p><b>04: Antidepressant drugs</b><br/>Neurochemical basis of depression<br/>TCAs, SSRIs, MAOIs and other atypical antidepressants,<br/>Anti-manic drugs</p> <p><b>05: Antipsychotic drugs</b><br/>Neurochemical basis of psychosis<br/>Pharmacology of anti-psychotic drugs:</p> <p><b>06: Local anaesthetic</b><br/>Drugs, mechanism of action, techniques of local anaesthesia, uses and hazards</p> | <b>Lecture/ Tutorial/ Class Assignment</b> | <b>14 hrs</b>  | Three item Examinations (Item 11, 12, 13) |

| LEARNING OBJECTIVES | Core Contents   | Teaching-Learning Strategies | Teaching Hours | * Evaluations |
|---------------------|---|------------------------------|----------------|---------------|
|                     | <p><b>07: General anaesthetics</b><br/>           Principles of General Anaesthesia<br/>           Preanaesthetic medication, Balanced Anaesthesia<br/>           Induction &amp; Maintenance: Intravenous anaesthetics &amp; Inhalation anaesthetics (nitrous oxides, halothane, fluranes)</p> <p><b>08: Skeletal muscle relaxation</b><br/>           Depolarizing and Non depolarizing</p> <p><b>09: Anti-emetics</b><br/>           Pathophysiology of vomiting<br/>           Pharmacology of anti-emetic drugs</p> <p><b>10: Antiparkinsonian Drugs</b><br/>           Pathophysiology of Parkinson's diseases<br/>           Pharmacology of antiparkinsonian drugs</p> <p><b>11: Antiepileptics/Anticonvulsants</b><br/>           Pathophysiology of epilepsy<br/>           Pharmacology of antiepileptic drugs</p> |                              |                |               |

| <i>Learning Objectives</i>   | <i>Core-Content</i>   | <i>Teaching-Learning Strategies</i>       | <i>Teaching Hours</i> | <i>* Evaluations</i>                 |
|--|---|---|-----------------------|--------------------------------------|
| <p>Student will be able to</p> <ul style="list-style-type: none"> <li>• describe:the role of biogenic amines &amp; prostaglandins in health &amp; diseases</li> <li>• explain their mechanism of actions, pharmacological effects, kinetics and toxicity</li> <li>• correlate these knowledge to form the basis for rational use of drugs in a given clinical situation</li> </ul> | <p><b>Autacoids and drugs used in inflammation</b></p> <p><b>LECTURES:</b></p> <p><b>01: Autacoids</b><br/>Definition and lists of autacoids<br/><b>Histamine:</b> synthesis, storage &amp; release, pharmacological actions &amp; physiological role<br/><b>Histamine antagonist:</b> H<sub>1</sub> antagonists: classification, role in allergic conditions &amp; other clinical uses and adverse reactions<br/>H<sub>2</sub>-receptor antagonists: role in peptic ulcer (covered with GIT Pharmacology)</p> <p><b>02: Ecosanoids</b><br/>Prostaglandins, Leukotrienes, Platelet Activating Factor (PAF)<br/>Synthetic pathways &amp; antagonists<br/>Physiological roles, pharmacological actions and possible clinical uses of synthetic analogues and antagonists</p> <p><b>03: NSAIDs/ Non-opioid analgesics</b><br/>Paracetamol (mechanism of antipyretic and analgesic action, adverse effects)<br/>NSAIDs (mechanism of action, adverse effects and precaution)<br/>Selective COX II inhibitors</p> <p><b>Drugs for Migraine</b></p> | Lecture/<br>Tutorial/ Class<br>Assignment | 5 hrs                 | One item<br>Examination<br>(Item 14) |
| <p><i>students will be able to:</i></p> <ul style="list-style-type: none"> <li>• list drugs which affect the respiratory system</li> <li>• describe their pharmacological effects</li> <li>• explain mechanism of actions,kinetics and toxicity</li> <li>• correlate these knowledge to form the basis for rational use of drugs in a given clinical situation</li> </ul>          | <p><b>Respiratory Pharmacology</b></p> <p><b>01. Drug treatment of bronchial asthma</b><br/>Bronchodilators-β<sub>2</sub> agonists, Aminophylline, Ipratropium and others<br/>Anti-inflammatory drugs – steroids, Leukotriene antagonist Chromolyn Sodium &amp; related drugs</p> <p>May be covered with ANS Pharmacology</p> <p><b>ADDITIONAL CONTENTS</b></p>   |   |                       |                                      |

| Learning Objectives   | Core Contents   | Teaching-Learning Strategies                 | Teaching Hours | * Evaluations   |
|---|---|--|----------------|---|
| <p><b>CHEMOTHERAPY</b></p> <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>Classify or list each group/ class of antimicrobial drugs</li> <li>Understand &amp; explain the mechanism of action, kinetics and toxicity of the antimicrobial drugs</li> <li>Describe the clinical uses, administration, adverse effects of different antimicrobial drugs used in different clinical situations and the precautions that should be taken before their use</li> <li>Correlate the gained knowledge to form the basis for rational use of medicines in a given clinical situation</li> </ul> | <p><b>CHEMOTHERAPY</b></p> <p><b>LECTURES:</b></p> <p><b>01: Introduction</b><br/>General concept, Mode of action &amp; Classification of antimicrobials<br/>Principles of antimicrobial therapy</p> <p><b>02: Drug Resistance</b><br/>Mechanism of development of drug resistance by microbes</p> <p><b>03: <math>\beta</math>-lactam Antibiotics</b><br/>Penicillins<br/>Cephalosporins<br/>Other <math>\beta</math>-lactam</p> <p><b>04: Protein Synthesis Inhibitors</b><br/>Aminoglycosides<br/>Macrolides<br/>Tetracyclines<br/>Chloramphenicol</p> <p><b>05: Sulfonamides &amp; Cotrimoxazole</b><br/>Sulfonamides combinations, Topical uses<br/>Cotrimoxazole</p> <p><b>06: Quinolones &amp; Fluoroquinolones</b></p> <p><b>07: Azoles :</b> Metronidazole and other azoles</p> <p><b>08: Drugs used in Tuberculosis</b></p> <p><b>09: Drugs used in Leprosy &amp; Kala-Azar</b></p> <p><b>10: Drugs used in Malaria:</b> Therapy &amp; Prophylaxis</p> <p><b>11: Drugs used in Fungal Infections</b></p> <p><b>12: Drugs used in Viral Infections</b></p> <p><b>13: Cancer Chemotherapy</b></p> | Lecture/<br>Tutorial/<br>Class<br>Assignment | 17 hrs         | Five item<br>Examination<br>(Item 15, 16,<br>17,18, 19) |

| Learning Objectives   | Core Contents  | Teaching-Learning Strategies                           | Teaching Hours       | * Evaluations                                 |
|---|--|--|----------------------|---|
| <p><b>CLINICAL PHARMACOLOGY</b></p> <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• state the principles of rational prescription</li> <li>• identify means of irrational prescribing and consequences</li> <li>• take measures to prevent irrational prescribing</li> <li>• select essential drugs in common diseases from EDL</li> <li>• select P drug – in some clinical situation</li> <li>• correlate these knowledge to form the basis for rational use of drugs in a given clinical situation</li> </ul> | <p><b>CLINICAL PHARMACOLOGY</b></p> <p><b>LECTURES:</b></p> <p>01: <b>Rational Prescribing</b><br/>General Principles, cuses &amp; consequences of irrational prescribing, Measures to prevent irrational prescribing</p> <p>02: <b>Drug Compendia (Information Sources)</b><br/>Pharmacopoeia, Formulary, Treatment guidelines, BP, INN, BNF, BDNf, etc.</p> <p>03: <b>Essential Drug concept</b><br/>Definition, Selection criteria, Essential Drug List<br/>Rationale for prescribing from this Drug List</p> <p>04: <b>'P Drug' concept</b><br/>Definition, Selection criteria, selection of 'P Drug' for some clinical situations</p> <p>05: <b>Drug selection for some special clinical conditions:</b> Pregnancy, different age groups, renal / hepatic failure</p> | <p>Lecture/<br/>Tutorial/<br/>Class<br/>Assignment</p> | <p><b>06 hrs</b></p> | <p>One item<br/>Examination<br/>(Item 20)</p> |

# Pharmacology Practicals

| Learning Objectives   | Core Contents  | Teaching Hours                                 |
|---|--|--|
| <p><b>GENERAL PRINCIPLES OF PHARMACOLOGY PRACTICALS:</b></p> <p>Laboratory experiments and demonstrations have been designed to help students to achieve:</p> <ul style="list-style-type: none"> <li>- the ability to relate the principles and concepts to specific clinical situations</li> </ul> <p>At the end of the course, students shall be able to:</p> <ul style="list-style-type: none"> <li>• identify different dosage formulations and their usage</li> <li>• understand, interpret and analyze experimental data relating to drug disposition</li> <li>• perform experiments using isolated animal tissues to understand drug action</li> </ul> | <p><b>GENERAL PRINCIPLES OF PHARMACOLOGY</b></p> <p><b>1. Prescription writing</b><br/>Format, legal &amp; ethical aspects, drug nomenclature, compliance and Exercise on Prescription Writing</p> <p><b>2. Drug Dosage Formulations</b><br/>Source &amp; Routes of drug administration<br/>Drug Formulation &amp; Delivery Techniques<br/>Exercise on Drug Dosage Formulations</p> <p><b>3. Clinical Pharmacokinetics</b><br/>Study of Time-Plasma Concentration Curves<br/>Determination of <math>t_{1/2}</math>, <math>V_d</math>, <math>Cl</math>, <math>K_e</math>, steady-state concentration, Loading &amp; Maintenance dose</p> <p><b>4. Study of Pharmacodynamics</b> <ul style="list-style-type: none"> <li>i. <b>Study of Dose Response Relationship</b><br/>Construction of Log Dose-Response Curves</li> <li>ii. <b>Study of Drug Antagonism</b><br/>Construction of Log Dose-Response Curves in presence of Antagonists</li> </ul> </p> <p><b>5. Adverse drug Reaction – Exercise on ADRs reporting &amp; monitoring</b></p> | 04 hrs<br>04 hrs<br>04 hrs<br>06 hrs<br>02 hrs |

| Learning Objectives   | Core Contents   | Teaching Hours                     |
|---|---|------------------------------------|
| <p><b>AUTONOMIC PHARMACOLOGY</b></p> <p><b>PRACTICALS:</b></p> <p>Laboratory experiments and demonstrations have been designed to help students to achieve:</p> <ul style="list-style-type: none"> <li>- the ability to relate the principles and concepts to specific clinical situations</li> </ul> <p>At the end of the session , students shall be able to:</p> <ul style="list-style-type: none"> <li>• understand, interpret and analyze experimental data relating to drug disposition</li> <li>• perform experiments using isolated animal tissues to understand drug action</li> </ul> | <p><b>AUTONOMIC PHARMACOLOGY</b></p> <ol style="list-style-type: none"> <li><b>1. Interpretation of Tracings on Blood Pressure</b><br/>Demonstration of presence of Autonomic receptors</li> <li><b>2. Langendorff's Preparation: Isolated Mammalian Heart</b><br/>Isolated Rabbit Heart Preparation<br/>Study of effect of drugs on isolated heart preparation</li> <li><b>3. Study of Effect of Drugs on Skeletal Neuromuscular Junction</b><br/>Demonstration of presence of Nicotinic receptors &amp; effect of competitive reversible &amp; irreversible neuromuscular blockers on them</li> </ol> | 06 hrs<br><br>04 hrs<br><br>02 hrs |

| Learning Objectives   | Core Contents  | Teaching Hours                                   |
|---|--|--|
| <p><b>CLINICAL PHARMACOLOGY</b></p> <p><b>PRACTICALS:</b></p> <p>Exercises have been designed to help students to understand the principles and concepts related to rational prescription.</p> <p>At the end of the session, students shall be able to:</p> <ul style="list-style-type: none"> <li>• evaluate drug information sources</li> <li>• understand the principles of rational prescription &amp; essential drug concept</li> <li>• select P drug</li> <li>• interprete and analyse the prescription supplied</li> </ul> | <p><b>CLINICAL PHARMACOLOGY</b></p> <ol style="list-style-type: none"> <li><b>1. Drug Information Sources</b><br/>Acomparative study of the ‘Prescribing binformation of Drugs’ as probided by the Manufacturers’ Product Literatures and the authentic Drug Compendia ( British National Formulary/ Bangladesh National Formulary)</li> <li><b>2. Essential Drug Concept</b><br/>Exercise on selection Essential Drugs</li> <li><b>3. ‘P Drug’ Concept</b><br/>Exercise on selection ‘P Drugs for different clinical situations &amp; preparation of student formulary</li> <li><b>4. Prescription Audit</b><br/>Exercise on ‘Prescription Audit’ using INRUD indicators</li> </ol> | 04 hrs<br><br>04 hrs<br><br>06 hrs<br><br>04 hrs |

## Pharmacology Tutorials

| Learning Objectives   |  | Contents  | Teaching Hours  |
|---|--|---|-----------------|
| Students will be able to: <ul style="list-style-type: none"><li>• list each group/class of drugs</li><li>• explain the mechanisms of action and Describe the uses, administration, kinetics, adverse effects &amp; precautions of used in different clinical conditions</li><li>• state the principles of rational prescription</li><li>• correlate these knowledge to form the basis for rational use of drugs in a given clinical situation</li></ul> | <b>TERM I</b>  | <ul style="list-style-type: none"> <li>• <b>General Pharmacology:</b><br/>Pharmacokinetics and Pharmacodynamics</li> <li>• <b>Autonomic Pharmacology:</b> <ul style="list-style-type: none"> <li>• Review of Cholinergic–Anticholinergic drugs</li> <li>• Revives of Adrenergic–Antiadrenergic drug</li> <li>• Drugs acting on Renal &amp; CVS</li> <li>• Review on Endocrine drug</li> <li>• Drugs for Bronchial asthma, PUD, Anemia</li> </ul> </li> </ul>      | <b>20 hours</b> |
|   | <b>Term II</b>   | <ul style="list-style-type: none"> <li>• Drugs used in Anxiety, sleep disorder</li> <li>• Drugs used in depression, epilepsy and parkinsonism</li> <li>• Autacoids &amp; NSAIDs</li> <li>• Chemotherapy for specific infections: Shigellosis, Enteric fever, ARIs, UTIs, malaria, tuberculosis, fungal infections</li> <li>• RUM: Principles of Rational prescribing &amp; means to resist pressure for irrational prescribing, Essential Drug Concept</li> </ul> | <b>10 hours</b> |
|   | <b>Clinical case studies &amp; presentation – 5 clinical Cases</b> |   | <b>20 hours</b> |

**Department of Pharmacology & Therapeutics**  
**Clinical Pharmacology Case Report**

Student's Name :

Class Roll # :

Remark of the Batch Teacher :

Professor of Pharmacology & Therapeutics

### **Patient's Particulars**

#### **Personal history**

Patient's name: Age:

Education: Occupation:

Socio-economic Status: Ward/Bed:

Date of Admission: Date of discharge:

#### **History of past illness (including Drug History)**

#### **Description of present illness (History & Clinical Findings)**

#### **Investigation done with results:**

#### **Provisional diagnosis:**

#### **Treatment given:**

#### **Drug therapy given**

(mention the exact brand name written in the treatment sheet and their corresponding generic name):

#### **Result & Outcome of the treatment:**

**Make a Summary of the Case Report** (Stating personal history, complaints, clinical findings, reports of investigations done, diagnosis made, treatment given & outcome of the treatment)

**A. Discussion about therapeutic problem & drug therapy given**

- 1. Define the therapeutic problem(s) of the case you have reported.**
- 2. Did the drug(s)/treatment given address all the therapeutic problem?**

Yes/No

**Relate the treatment/drugs given to specific therapeutic problem.**

If no, explain why?

**3. For each drug given, was their other alternatives?**

- 4. Considering the drug(s) given & the alternatives, whether the choice was MOST appropriate**  
(consider drug's effectiveness (benefit), Risk & Cost, Route of Administration, Dosage, Frequency & Duration of Therapy and Patient's Factors like age, Pregnancy & Diseases).

**B. Comments on Prescription**

- 1. Was the route of administration, dosage, frequency & duration of therapy properly mentioned?**
- 2. Was the patient warned about possible adverse effects of each drug & how to avoid them?**

**C. Report on Averse Effects**

Was there any reported adverse effects in this case?

If yes, what are the clinical manifestations & how they have been managed?

**D. Final Comments:**

**E. Drug Discussion**

**Brief information about the drug(s) used in the therapy** (including Generic name/  
International Non-proprietary name, Pharmacological effects, Mechanism of action, Metabolism  
and Elimination, Important drug-drug and drug-food interactions)

**Signature of the student**

# **Department of Pharmacology & Therapeutics**

## **Students' In-Course Evaluation Card**

Name of Student:

Year:

Roll No.:

Batch:

Session:

Address:

SSC Exam Year:

GPA:

HSC Exam Year:

GPA:

Admission in Medical College:

First Professional Examination Passed in \_\_\_\_\_ at first/second/third chance

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### **For Official Use Only**

|           | TERM I |          | TERM II |          | FINAL |          |
|-----------|--------|----------|---------|----------|-------|----------|
|           | Held   | Attended | Held    | Attended | Held  | Attended |
| Lecture   |        |          |         |          |       |          |
| Practical |        |          |         |          |       |          |
| Tutorial  |        |          |         |          |       |          |
| Seminar   |        |          |         |          |       |          |

Head of the Department

Department of Pharmacology & Therapeutics

\_\_\_\_\_ Medical College

## Students' In-Course Evaluation Card

### **TERM I**

| SL No | Title and contents  | Marks | Initial of teacher |
|-------|---|-------|--------------------|
|       | <b>TERM I</b>   |       |                    |
| 01.   | Introduction to Pharmacology<br>Sources of Drug and Dosage Formulation<br>Routes of Drug Administration |       |                    |
| 02.   | Pharmakokinetics<br>Absorption, Distribution, Biotransformation and Excretion                           |       |                    |
| 03.   | Pharmacodynamics<br>Mechanism of Drug Action, Adverse Drug Events                                       |       |                    |
| 04.   | Cholinergic agonists and antagonists  |       |                    |
| 05.   | Adrenergic agonists and antagonists   |       |                    |
| 06.   | Diuretics and Drugs used in Hypertension  |       |                    |
| 07.   | Antiangular, anticoagulant, thrombolytic, lipid lowering agents<br>Drugs used in heart failure          |       |                    |
| 08.   | Hemopoietics  |       |                    |
| 09.   | Drugs used in Diabetes Mellitus<br>Hormonal Contraceptives<br>Thyroid hormones and Anti-thyroid Drugs   |       |                    |
| 10.   | Gastrointestinal Pharmacology   |       |                    |
|       | <b>FIRST TERM EXAMINATION</b>   |       |                    |

### **Students' In-Course Evaluation Card (contd.)**

### **TERM II**

|     |  |  |  |
|-----|--|--|--|
| 11. | Drugs used in anxiety and sleep disorder<br>Benzodiazepines and Non-Benzodiazepines                              |  |  |
| 12. | Antipsychotics, Antidepressants and Anticonvulsants  |  |  |
| 13. | Analgesics, Anesthetics and Drug dependence  |  |  |
| 14. | Autacoids, Anti-inflammatory drugs (NSAIDs) and Steroidal agents   |  |  |
| 15. | General aspects of chemotherapy<br>Development of Drug resistant<br>Microbiological profile of common infections |  |  |
| 16. | $\beta$ lacatms<br>Sulphonamides, Cotrimoxazole, Quinolones and Azoles   |  |  |
| 17. | Tetracyclines, Chloramphenicol, Aminoglycosides and Macrolides   |  |  |
| 18. | Drugs used in<br>Tuberculosis, Leprosy, Malaria, Kala-azar, Amebiasis,<br>Filariasis and Helminthiasis           |  |  |
| 19. | Antifungal, Antiviral, Anti-scabies, Anti-neoplastic   |  |  |
| 20. | Clinical Pharmacology & Rational prescribing   |  |  |
|     | <b>SECOND TERM EXAMINATION</b>   |  |  |

# Summative Assessment of Pharmacology & Therapeutics

## Assessment Systems and Mark Distribution

| Components  | Marks    | Total Marks |
|---|----------|-------------|
| Formative assessment  |          | 10          |
| <b>WRITTEN EXAMINATION</b><br>MCQ<br>SAQ                                      | 20<br>70 | 90          |
| <b>PRACTICAL EXAMINATION</b><br><br>Traditional Practical Examination<br>OSPE | 60<br>40 | 100         |
| <b>ORAL EXAMINATION (Structured)</b><br>2 Boards                              | 50+50    | 100         |
| <b>Grand Total</b>  |          | <b>300</b>  |

115

- There will be separate Answer Script for MCQ
- Pass marks 60 % in each of theoretical, oral and practical

# Summary of the Pharmacology Academic Program

|  | <b>Term I</b>    | <b>Term II</b>   | <b>Total Teaching hours</b> |
|--|------------------|------------------|-----------------------------|
| Lectures/Revision                                    | 58 hours         | 42 hours         | 100 hours                   |
| Practicals & Demonstrations                          | 32 hours         | 18 hours         | 50 hours                    |
| Tutorials  | 20 hours         | 10 hours         | 30 hours                    |
| Clinical case report<br>Assignment with presentation |                  | 20 hours         | 20 hours                    |
| <b>Total</b>   | <b>100 hours</b> | <b>100 hours</b> | <b>200 hours</b>            |

## Time allocation for Examination:

| Time for delivering 200 hrs teaching | Formative Examination & holidays | Summative Examination |           | <b>Total Time</b> |
|--------------------------------------|----------------------------------|-----------------------|-----------|-------------------|
|                                      |                                  | Preparatory leave     | Exam time |                   |
| 7 months                             | 2 months                         | 1 month               | 2 months  | 12 months         |

# PHARMACOLOGY COURSE ORGANIZATION

| TERM I   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | TERM II                                 |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
|--|---|---|---|---|---|---|---|---|----|----|----|----|----|----|---|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| REGULAR  |   |   |   |   |   |   |   |   |    |    |    |    |    |    | REGULAR                                 |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16                                      | 17 | 18 | 19 | 20 | 21—26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47-52 |
| <b>Total hours for lecture</b>                 |   |   |   |   |   |   |   |   |    |    |    |    |    |    | <b>Total hours for lecture</b>          |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| General Principles of Pharmacology             |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Central nervous System                  |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Autonomic Nervous System                       |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Autacoids and Dugs used in Inflammation |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Renal and Cardiovascular Pharmacology          |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Chemotherapy                            |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Haemopoietic Pharmacology                      |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Clinical Pharmacology                   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Gastrointestinal Pharmacology                  |   |   |   |   |   |   |   |   |    |    |    |    |    |    |   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Endocrine pharmacology                         |   |   |   |   |   |   |   |   |    |    |    |    |    |    |   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| <b>Total hours for Practicals</b>              |   |   |   |   |   |   |   |   |    |    |    |    |    |    | <b>Total hours for Practicals</b>       |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Prescription writing                           |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Drug information Sources                |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Dosage Formulations & Drug delivery techniques |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Prescription Audit                      |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Pharmacokinetic Study                          |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Essential Drug List                     |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Pharmacodynamic Study                          |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Exercise on selection of "P" drugs      |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Study of the cardiovascular effects of drugs   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Study of autonomic receptor function           |   |   |   |   |   |   |   |   |    |    |    |    |    |    |   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Study of drugs on Skeletal N-M junction        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |
| Exercise on ADR reporting form fillup          |   |   |   |   |   |   |   |   |    |    |    |    |    |    |   |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |       |

| TERM I cont.                     |            | TERM II cont.                    |            |
|----------------------------------|------------|----------------------------------|------------|
| <b>Total hours for Tutorials</b> | = 20 hours | <b>Total hours for Tutorials</b> | = 10 hours |
| <b>General Pharmacology:</b>     |            |                                  | = 01 hours |
| Pharmacokinetics and             | = 02 hours |                                  | = 01 hours |
| Pharmacodynamics                 | = 02 hours |                                  |            |
| <b>Autonomic Pharmacology:</b>   |            |                                  |            |
| • Review of Cholinergic &        | = 02 hours |                                  | = 02 hours |
| Anticholinergic drugs            |            |                                  |            |
| • Revives of Adrenergic&         | = 02 hours |                                  | = 04 hours |
| Antiadrenergic drug              | = 04 hours |                                  |            |
| • Drugs acting on Renal & CVS    | = 04 hours |                                  |            |
| • Review on Endocrine drug       |            |                                  |            |
| • Drugs for Bronchial asthma,    | = 04 hours |                                  |            |
| PUD, Anemia                      |            |                                  |            |