

SYLLABUS FOR PHARMACOLOGY AND TOXICOLOGY COURSES

PCL 301: INTRODUCTION TO PHARMACOLOGY AND TOXICOLOGY (2C)

Aim: To provide learners with an understanding of basic terms and principles of pharmacology with special reference to pharmacodynamics, pharmacokinetics and pharmacogenetics. To also provide learners with an understanding of basic principles of toxicology with emphasis on toxic chemicals pollutants and basic drug overdosage scenarios.

Learning Outcome:

At the end of the course, the student should

- (i) Know the theories and principles of drug action
- (ii) Know factors that influence drug action
- (iii) Know effects of toxicants and environmental pollutants toxicants on organ system and drug disposition.

Course Content: Definition of terms, routes of drug Administration, drug absorption, distribution, elimination and factors affecting them, Pharmacodynamics-mechanisms of drugs action, receptor and non-receptor theory, signal transduction and second messengers, drug potency and efficacy, dose-response relationships, agonists and antagonisms, tolerance and tachyphylaxis, measurement of some pharmacological parameters. Basic principles of toxicology and biochemical mechanism of toxicity in mammalian species and man, Classes of toxicants, introduction to toxicogenomics, disposition of toxicants. Introduction to Pharmacogenomics and pharmacogenetics

PCL 302: AUTONOMIC NERVOUS SYSTEM (3C)

Aim: To provide learners with an understanding of basic functions of the autonomic nervous system and how drugs modify their functions.

Learning Outcome:

At the end of the course, the student should be able

- (i) To know the parasympathetic, sympathetic and neuromuscular transmissions and drug that modify their functions.
- (ii). To appreciate the classification of receptors.
- iii). Know the basis of structure activity relationships and how it affects drug action.

Course Content: Theory of Chemical Neurotransmitters – Evidence for Acetylcholine receptors, synthesis, storage, release, action, termination of action of acetylcholine. Parasympathomimetic and parasympatholytic drugs, Cholinesterases and Anti-cholinesterases. Neuromuscular transmission and drugs affecting neuromuscular transmission. Single nucleotide polymorphisms and individual variations; genetic variants of human serum cholinesterase on muscle relaxant effect of succinylcholine. Structure – Activity relationships among the cholinergic and anticholinergic agents.

Evidence for noradrenaline as the adrenergic neuro-transmitter, synthesis, storage, release, metabolism, and uptake of catecholamines. Adrenergic receptors – types of adrenoceptors. Concept of agonists and antagonists. Sympathomimetic amines – catecholamines, properties and uses. Sympatholytic drugs (adrenergic blockers) properties and uses. Structure – Activity Relationships among the sympathomimetic amines and Adrenergic Blockers. Non-adrenergic non-cholinergic neurotransmitters

PCL 303: PHARMACOLOGY OF THE GIT, OCULAR AND HAEMOPOETIC SYSTEM (2C)

Aim: To provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of systemic diseases and dysfunction of the eye and GIT including diarrhea, constipation, vomiting inflammatory disease, peptic ulcer, glaucoma, anaemia and blood clotting disorders.

Learning Outcome:

- i). Know the drugs and classes of drugs used in the management of selected systemic disorders
- ii). Know the mechanism of action, disposition, side effects, drug-drug interactions, contra-indication of the drugs.

Course Content: *Drugs acting on the GIT:* antispasmodics, diarrhea and drug treatment of diarrhea. Management of constipation; bulk laxatives, osmotic laxatives, stimulant drugs, stool softeners. Drug treatment of inflammatory bowel disease, emesis and antiemetic drugs, drug treatment of peptic ulcer, *Drugs acting on the ocular system:* miotics, and mydriatic drugs used in glaucoma, cycloplegics, ophthalmic diagnostic agents, *Drugs acting on the haemopoetic System:* drugs used in the treatment of iron deficiency anaemias, megaloblastic anaemia and pernicious anaemia. Anticoagulants, and vitamins. Antithrombotic and thrombotic agents.

PCL 304: EXPERIMENTAL PHARMACOLOGY I (1C)

Aim: To provide the learner with hands-on experience on basic pharmacological concepts for a better understanding of the concepts

Learning Outcome:

- To know effects of route of drug administration on drug action.
- Know effects of enzyme inhibition and induction on action of drugs
- Know effect of agonist and antagonist at receptor sites
- Know dose response relationship and how to plot dose response curves
- Know how to determine the relationship between effective dose and lethal dose of drugs

- Know methods in toxicology
- Know single nucleotide polymorphisms.

Course Content: Animals as experimental tools in pharmacology; definition of laboratory animals, types and essential features, diets and maintenance of laboratory animals, principles of animal care, use and ethics. Practical sessions on, routes of drug administration, Autonomic nervous system including effects of agonists and antagonists on isolated tissue (using guinea pig ileum, rabbit jejunum, rat phrenic nerve, frog rectus abdominis muscle or rat uterus), effects of enzyme alteration on drug action –effects of pretreatment with carbon tetrachloride or phenobarbitone in mice treated with thiopentone, Effect of drugs on gastrointestinal motility. Methods in toxicology I including ED₅₀, LD₅₀ determination, Therapeutic index calculation, Brine shrimp tests, Ame’s test, acute and chronic poisoning. Application of Polymerase Chain Reactions (PCR) in genotyping and identification of SNPs

PCL 401: CARDIOVASCULAR AND RENAL PHARMACOLOGY (2C)

Aim: To provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of cardiovascular and renal diseases.

Learning Outcome:

- Good understanding of the aetiology of cardiovascular and renal diseases.
- Understanding site of action, mechanism of action and clinical application of drugs used in the treatment of cardiovascular and renal diseases.

Course Content: Hypertension and Antihypertensive drugs, anti-arrhythmic drugs, anti-angina drugs, cardiac glycosides, lipid lowering drugs, outline of renal function, drugs acting on the kidney, drugs which alter urine pH. Drugs which alter excretion of organic molecule.

PCL 402: PHARMACOLOGY OF THE CNS (2C)

Aim: To provide learners with a basic understanding of clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain CNS disorders and the pharmacology of drugs affecting mediators of inflammation and pain,

Learning Outcome:

- Good understanding of the aetiology of CNS disorders and pain.
- Understanding site of action, mechanism of action and clinical application of drugs used in the treatment of CNS disorders, pain and inflammation.

- Understanding the concept and implications of drug dependence and abuse.

Course Content: Anxiolytic and hypnotic drugs, antipsychotic drugs, antidepressant drugs, CNS stimulants, anticonvulsants, drugs used for neurodegenerative diseases (Parkinson's disorder, Alzheimer's disease), Pharmacology of pain including migraine: analgesics (narcotic and non-narcotics), local anaesthetic and general anaesthetic agents, drug dependence and drug abuse .

PCL 403: CHEMOTHERAPY (2 C)

Aim: To provide learners with a basic understanding of the principles of chemotherapy, the mechanisms by which anti-infective and anticancer drugs act, and the management and treatment of infectious diseases and cancer.

Learning Outcome

- (i) To acquaint the student with the theories on the aetiology of cancer, bacterial, fungal, & viral infections, and common tropical diseases, and the various pathophysiological states associated with these diseases.
- (ii) To acquaint the student with the mechanisms of action of the various chemotherapeutic drugs and their toxic effects;
- (iii). To acquaint the student with the mechanisms of drug resistance, role of immunity in chemotherapy, and the rationale for combination therapy.

Course Content: Basic principles of chemotherapy, antibacterial agents, antiviral drugs, Antiretroviral agents, anti fungal drugs, drug treatment of tuberculosis and leprosy, Chemotherapy of tropical infections; malaria, amoebiasis, schistosomiasis, trypanosomiasis, leishmaniasis, helminthiasis, toxoplasmosis. Cancer chemotherapy.

PCL 404: EXPERIMENTAL PHARMACOLOGY II (1C)

Practicals on organ systems; Practical on organ systems; Induction of general anesthesia in rabbits or rats, Pain; chemical, thermal or mechanical methods of nociception. Models for testing antipsychotic and antidepressant drug effects; Apomorphine induced stereotypic behaviour, false swimming test in mice, locomotor activity test in mice. Inflammation: Effects of drugs on carrageenan-induced rat-paw edema, CVS; demonstration of Isolated perfused heart (Langen-dorff) preparation, the effect of parasympathomimetic drugs on cardiovascular system (in vivo) and adrenergic mechanisms using cat blood pressure. Identification of drug metabolites in urine using Spot's Test. Methods in toxicology II including antidotes and poisoning management; identification of drugs by thin layer chromatography; Experimental procedures for analysis of toxicological agents; Comet assay, dermal toxicity sensitization, irritation or corrosion test using rabbit, guinea pig or mice. Molecular pharmacology techniques.

PCL 501: IMMUNOPHARMACOLOGY AND RESPIRATORY PHARMACOLOGY (2C)

Aim: To provide learners with a basic understanding of the immune system, their role in inflammation. To also provide the learning with a knowledge of drugs for the treatment of inflammatory and respiratory disorders

Learning Outcome:

- Good understanding of components of immune system and modes of immune response.
- Understand the mechanism, which underlie the action of mediators of inflammation and immune response.
- Understanding site of action, mechanism of action and clinical application of anti-inflammatory and immunosuppressant drugs.
- Understanding site of action, mechanism of action and clinical application of drugs used in the management of cough.

Course Content: Components of the immune system including T-cells , B-cells and macrophages, mode of immune response, autocooids, histamine, cytokines, prostaglandins and antagonists, Inflammation and immune reactions, anaphylaxis, non- steroidal anti-inflammatory drugs, anticytokine drugs, immunosuppressant drugs, anti rheumatoid drugs, antiasthma drugs, expectorants, antitussives, and mucolytic drugs.

PCL 502: SYSTEMIC TOXICOLOGY AND HEALTH SAFETY (2C)

Aim: To provide learners with understanding of forensic and clinical toxicology, prevention of toxicity and pharmacovigilance .

Learning Outcome:

- (i) To acquaint the student with the concepts of organ toxicology and the roles of the various disciplines in toxicology;
- (ii) To acquaint the student with the numerous sources, site and mechanisms of how drugs can and do act as hazards on biological system;
- (iii) To acquaint the student with the types of adverse effects and examples which produce them;
- (iv) To acquaint the student with the toxicological prerequisites for evaluating new drugs in different countries;
- (v) To acquaint the student with the post-marketing surveillance of drugs.

Course Content: Toxicity in organ systems (Hepatotoxicity, nephrotoxicity, toxicology of the nervous system, neurotoxicity, toxicity of the endocrine system, respiratory system, reproductive system, and blood as a target organ), correlation between morphological and functional changes caused by toxicants and environmental pollutants in different organs. Investigation of toxicity related injury/death, Human health risk assessment- Risk

assessment methods, Prevention of toxicity in different environments- legislation and regulation affairs, Environmental Impact Assessment, hazard identification, risk characterization, Toxicological evaluation of a new drug. Post market surveillance of drugs and OTC herbal supplements.

PCL 503: ENDOCRINE PHARMACOLOGY (2 C)

Aim: To provide learners with a basic understanding of the prevention and clinical management, of endocrine disorders.

Learning Outcome:

- (i). Know the function of different natural and synthetic hormones.
- ii). Know the role of the natural hormones in endocrine disorders.
- iii). Know the use of synthetic hormones and drugs to treat and manage endocrine disorders

Course Content: Thyroid and antithyroid drugs, parathyroid hormones, Calcitonin, Insulin and oral hypoglycemic agents, glucagon, anterior and posterior pituitary hormones, hormone inhibiting and release factors, adrenal corticosteroids, oestrogen and progesterone, oral contraceptives and fertility agents, androgen and anabolic steroids.

SUMMARY

S/ N	COURSE CODE	COURSE TITLE	UNIT / STATUS	SEMESTER
1	PCL 301	INTRODUCTION TO PHARMACOLOGY AND TOXICOLOGY	2/C	1ST
2	PCL 302	AUTONOMIC NERVOUS SYSTEM	3/C	1ST
3	PCL 303	PHARMACOLOGY OF THE GIT AND HEMOPOETIC SYSTEM	2/C	2ND
4	PCL 304	EXPERIMENTAL PHARMACOLOGY I	1/C	2ND
5	PCL 401	CARDIOVASCULAR AND RENAL PHARMACOLOGY	2/C	1ST
6	PCL 402	PHARMACOLOGY OF THE CENTRAL NERVOUS SYSTEM	2/C	1ST
7	PCL 403	CHEMOTHERAPY	2/C	2ND
8	PCL 404	EXPERIMENTAL PHARMACOLOGY II	1/C	2ND
9	PCL 501	IMMUNOPHARMACOLOGY AND RESPIRATORY PHARMACOLOGY	2/C	1ST
10	PCL 502	SYSTEMIC TOXICOLOGY AND HEALTH SAFETY	2/C	1ST

11	PCL 503	ENDOCRINE PHARMACOLOGY APPLIED TOXICOLOGY AND HEALTH SAFETY	2/C	2 ND
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COMPULSORY - 21 UNITS