

DETAILED SYLLABUS FOR II M.B.B.S

PHARMACOLOGY

1. CURRICULUM

The curriculum has been designed as per MCI recommendations. MCI has allocated approximately 300 hours for teaching pharmacology over a period of three semesters. The theory classes would comprise of 125 hours of didactic teaching. The practical classes would comprise of 120 hours. The time allocated for the tutorials is approximately 60 hours. This will include seminars assignments and problem based learning.

GOAL:

The goal of teaching the 2nd year undergraduate students in Pharmacology is to impart a holistic knowledge of Pharmacology and inculcate a rational and scientific basis of therapeutics.

OBJECTIVES:

Knowledge:

At the end of the course the students shall be able to know

1. The general principles of actions and effects of various drugs and their kinetics.
2. Dose related effects of drugs.
3. Indications, contraindications, interactions and adverse effects of therapeutically used drugs.
4. The concept of essential drugs, the essential drug list of our country.
5. The importance of rational drug therapy.
6. To prescribe rationally based on the efficacy, safety and cost effectiveness for a particular disease depending on both individual and community needs.
7. To prescribe drugs in special situations such as pregnancy, lactation, infancy and old age.
8. To prescribe for mass therapy under National health programmes.
9. The drugs of addiction and the management of addiction.
10. Antidotes and drugs used in common poisoning.
11. The various environmental and occupational pollutants, their effects on human health and the management.
12. The different types of biomedical waste, their potential risks and the management of health hazards caused by them.
13. The ethics and modalities in the development of new drugs and the ethics in clinical practice and animal ethics.

Skills:

At the end of the course the student shall be able

1. To prescribe drugs for common ailments.
2. To recognize the side effects, adverse reactions and interactions of commonly used drugs.
3. Instruct patients how to use various drug delivery systems such as inhalers, nebulizers etc.
4. To calculate the dose of drugs according to age, body surface area, weight and associated diseases such as heart failure, renal and hepatic impairment.
5. To determine the rate of infusion of vital drugs such as dopamine, dobutamine, oxytocin and intravenous fluids.
6. To carry out experiments for the study of effect of drugs in animals and human volunteers.
7. To interpret the experimental data derived from various studies.
8. To critically evaluate the information on common pharmaceutical preparation (drug formulations).

Integration:

Simultaneous knowledge of physiology, pathology, clinical presentation and therapy of Common diseases will be imparted to the students by both horizontal and vertical Integrated teaching, seminars, group discussions and conferences.

UNIT - I

GENERAL PHARMACOLOGICAL PRINCIPLES: 12 Hours
1. Definition of Terms in Pharmacology:

(Pharmacology, Drug, Pharmacokinetics, Pharmacodynamics, Pharmacy, Clinical pharmacology, Pharmacotherapeutics, Pharmacoeconomics, pharmacogenetics, Pharmacogenomics, chemotherapy, toxicology, pharmacoepidemiology, pharmacopoeia, placebo, chronopharmacology, ethno pharmacology, pharmacognosy and pharmacovigilance.

Drug nomenclature (chemical name, non - proprietary name, brand name) Essential drug concept, Orphan drugs, National drug policy.

Sources of drugs with examples (plants, animals, minerals, synthetic, micro-organisms, genetic engineering)

2. Routes of drug administration:

Enteral route ---	Oral, buccal, sublingual, rectal route,
Parenteral route --- intradermal,	Intravenous, intramuscular, subcutaneous, Intra-arterial, intra-articular, intrathecal, intraocular, Inhalation (for local and for systemic effect). Topical application (for local and for systemic effect) Advantages and disadvantages of above mentioned routes.

3. Special drug delivery systems:

Transdermal, ocusert, implants, osmotic pump, liposome encapsulation, drug targeting and pro-drugs.

4. Pharmacokinetics:

Absorption	-	Structure and function of biological membrane, different processes involved in absorption and factors affecting drug absorption.
Bioavailability	-	Bioavailability, factors affecting bioavailability and bioequivalence.
Distribution	-	Volume of distribution, redistribution, plasma protein binding and tissue storage and barriers of distribution (blood brain barrier, placental barrier)
Biotransformation	-	Metabolism of drugs – sites, phases – phase I (non – synthetic), phase II (synthetic) with examples, microsomal enzyme induction, inhibition and their consequences, first pass metabolism and their effects and enterohepatic circulation.
Elimination in clinical drug.	-	Renal, rectal, pulmonary , biliary excretion, excretion breast milk, skin and salivary elimination, kinetics of elimination , clearance, plasma half-life and its significance, loading dose, maintenance dose, steady state concentration, therapeutic drug monitoring and methods of prolonging the duration of action of a drug.

5. Pharmacodynamics:

Principles of drug action (stimulation, depression, irritation, replacement, cytotoxic action) mechanisms of drug action with examples: (physical action, chemical action, through enzymes, through receptors). Competitive antagonism, non – competitive antagonism. Receptor-definition and types, agonist, antagonist, partial agonist, inverse agonist, ligand, affinity, intrinsic activity (efficacy), drug action, drug effect. Transducer

mechanisms Receptor types, structure and function. Regulation of receptors, Dose-response relationship- potency, efficacy, selectivity.

Therapeutic index and therapeutic window, combined effect of drugs - synergism (additive, Supraadditive), antagonism (physical, chemical, physiological, receptor) - definitions with examples. Fixed drug combination - advantages, disadvantages with examples. Factors modifying drug action, tolerance (cross tolerance, tachyphylaxis,) drug resistance, cumulation.

6. Adverse drug reactions:

Classification, side effects, secondary effects, toxic effects, intolerance, idiosyncrasy, drug allergy, (types, treatment, examples) photosensitivity, drug toxicity - p glycoprotein, drug dependence, drug withdrawal reactions, teratogenicity, carcinogenicity, mutagenicity, drug induced diseases (Iatrogenic disease) - definitions with examples.

7. Drug interactions:

Drug - Drug interactions, pharmacological basis of drug interactions, clinical Significance of drug interactions. Identifying potential drug interactions (outside the body, at site of absorption, during distribution, on receptors, during metabolism, drug excretion), drug food interactions and drug and body tissue interaction.

8. Bioassay

Definition, principles of bioassay and types of bioassay.

9. Clinical pharmacology and rational drug use

Principles of drug therapy Principles of prescription writing: Prescribing drugs, drug history, p-drug concept, cost - containment, repeat prescriptions, warnings and consent, compliance (patient and doctor), placebo medicines and self - medication. Prescription of common disorders Drugs in children and pregnancy Drugs in geriatrics Clinical uses of drugs in hepatic and renal failure

Adverse drug reaction monitoring and reporting Drug discovery and drug development - clinical drug development (techniques of discovery, models, preclinical studies in animals), ethics, informed consent, phases of clinical development (Phase 1, phase 2, phase 3, phase 4 (post marketing surveillance), types of clinical trials, design of trials, pharmacoepidemiology, pharmacovigilance and pharmacoconomics.

UNIT - II

DRUGS ACTING ON AUTONOMIC NERVOUS SYSTEM : 12 Hours

1. **General considerations-** Differences between somatic and autonomic nervous system, sympathetic and parasympathetic system, general outlay of autonomic nervous system, steps in neurohumoral transmission, co transmission.
2. **Cholinergic system-** cholinergic transmission, characteristics of muscarinic receptors, nicotinic receptors and cholinergic responses mediated. cholinergic drugs*-classification, cholinergic agonists - cholinomimetic alkaloids, anticholinesterase (reversible and irreversible), pharmacological actions and uses. Pharmacotherapy of glaucoma and myasthenia gravis and anticholinesterase (organophosphorous compounds) poisoning.
3. **Anticholinergic drugs***-classification, atropine* (prototype), atropine substitutes* (mydriatics, antisecretory-antispasmodics, antiparkinsonian), atropine poisoning
4. **Drugs acting on autonomic ganglia**-clinically important ganglionic stimulants and ganglion blockers.
5. **Adrenergic transmission and its modification by drugs.**
Adrenergic receptors & adrenergic responses mediated
Adrenergic drugs*- classification, (Catecholamines, (adrenaline*, nor adrenaline, dopamine) and non catecholamines, β agonists), pressor agents, cardiac stimulants, bronchodilators, nasal decongestants, CNS stimulants, anorectics, uterine relaxants and vasodilators.
6. **Anti-adrenergic drugs*** - classification, α blockers* - (Phenoxybenzamine as prototype),
 β blockers* - (Propranolol* as prototype)
 α & β blockers - (Labetalol)

* mechanism of action, pharmacological actions, adverse drug reactions, precautions, contraindications, preparations, drug interactions, therapeutic uses/indications.

UNIT - III:

SKELETAL MUSCLE RELAXANTS: 1 Hour

1. Peripheral neuromuscular blockers *- classification*
2. Centrally acting muscle relaxants.
3. Directly acting muscle relaxants.

UNIT IV:

LOCAL ANAESTHETICS : 1 Hour

Classification, mechanism and actions of local anaesthetics, synergism with vasopressors, adverse effects, indications, contraindications and complications of different routes of administration of local anaesthetics.

UNIT -V:

AUTACOIDS AND RELATED DRUGS: 9 Hours

Definition, the various autacoids, their physiological and pathological actions and effects.

1. Histamine actions, releasers, anaphylaxis, clinical significance of histamine, betahistine.
Conventional H₁ antihistamines* - classification,
Second generation H₁ antihistamines*,
Drug therapy of vertigo and motion sickness.
2. 5HT(serotonin) – 5HT agonists and antagonists (pharmacological actions, preparations and therapeutic uses).
Ergot alkaloids - preparations and uses.
Pharmacotherapy of migraine.
3. Bradykinin and their antagonists.
4. Angiotensin and ACE inhibitors* and angiotensin receptor antagonist.
5. Lipid derived autacoids – eicosanoids (prostaglandins*, leukotrienes) and platelet activating factor, PAF antagonists – clinical significance, preparations and uses.
6. Non steroidal anti – inflammatory drugs -classification, Aspirin* (prototype), non-selective and selective cyclooxygenase inhibitors*. Drugs used for rheumatoid arthritis and gout.

* mechanism of action, pharmacological actions, adverse drug reactions, precautions, contraindications, preparations, drug interactions, therapeutic uses/indications

UNIT - VI

DRUGS ACTING ON THE CENTRAL NERVOUS SYSTEM: 18 Hours

Physiological role of neuro transmitters (excitatory, inhibitory), principles of neuronal regulation and basis of drug action in the CNS.

1. **General anaesthetics***- Definition, mechanism of action, stages of anesthesia, classification, properties of inhalational anesthetics, advantages and disadvantages. Intravenous anaesthetics* - (inducing agents, slower acting drugs) Dissociative anesthesia (ketamine), neuroleptanalgesia. Preanaesthetic medication.
2. **Aliphatic alcohol** - Pharmacological actions, interactions, toxicity, clinical uses. Disulfiram, treatment of alcoholism and treatment of methyl alcohol poisoning.

3. **Sedative - hypnotics.** Definition, classification – barbiturates*, benzodiazepines*, Non- Benzodiazepine hypnotics*, benzodiazepine antagonist. Treatment of barbiturates poisoning.
4. **Antiepileptic drugs** – Classification of drugs* Pharmacotherapy of epilepsy, Management of status epilepticus.
5. **Drugs for CNS degenerative disorders.**
Drugs for Parkinsonism – classification of drugs*, pharmacotherapy of alzheimer’s disease, huntington’s disease, motor neuron disease.
6. **Antipsychotic drugs** – Classification* (chlorpromazine* prototype) Atypical Antipsychotics* Pharmacotherapy of Schizophrenia. Antianxiety drugs – Classification* Sedating, non sedating antianxiety drugs, Pharmacotherapy of anxiety. Antidepressant drugs – Classification* (Imipramine* prototype) MAO inhibitors Selective serotonin reuptake inhibitors (SSRI’s) Antimanic drugs – Lithium* and others.
7. **Opioid Analgesics** – Classification* (Morphine* prototype) Management of acute morphine poisoning, Other opioids, partial agonists, agonist – Antagonists, Pure antagonists, Management of opium dependence
8. **Drug addiction and drug abuse.**
9. **CNS stimulants** - Classification*, Cognition enhancers (Nootropics) – uses with examples.
10. **Therapeutic Gases** – Oxygen, Nitrous oxide, carbon dioxide and their use.
 *_mechanism of action, pharmacological actions, adverse drug reactions, precautions, contraindications, preparations, drug interactions, therapeutic uses/indications.

UNIT - VII

DRUGS ACTING ON CARDIOVASCULAR SYSTEM : 8 Hours

1. **Drugs affecting renin angiotensin system-** angiotensin converting enzyme inhibitors - captopril (prototype)*, angiotensin receptor antagonist losartan (prototype)*
2. **Drugs therapy of heart failure** – classification, Cardiac glycosides*, digitalis toxicity. Newer inotropic agents, role of vasodilators, beta blockers*, ACE inhibitors and diuretics in heart failure.
3. **Drug therapy of arrhythmias** – Classification*, preparations, classes, mechanism of action, indications. Torsades de pointes.
4. **Lipid lowering drugs for the treatment of hypercholesterolemia** – Classification, Mechanism of action, pharmacological actions, adverse effects, contraindications drug interactions and uses.
5. **Drug therapy of Hypertension** – Classification*, angiotensin converting enzyme inhibitors, angiotensin receptor antagonist, calcium channel blockers,

diuretics, beta blockers, alpha blockers, vasodilators, central sympatholytics.

Management of hypertensive emergencies

6. **Drugs for myocardial ischaemia** – Classification*, rationale of combination therapy in angina pectoris, role of antiplatelet drugs . Drug treatment of myocardial infarction.

7. **Drugs used in peripheral vascular diseases.**

*** mechanism of action, pharmacological actions, adverse drug reactions, precautions, contraindications, preparations, drug interactions, therapeutic uses/indications.**

UNIT - VIII

DRUGS ACTING ON WATER, ELECTROLYTES AND DRUGS AFFECTING RENAL FUNCTION: 4 Hours

1. **Water and electrolytes** – transport, imbalance, effects and management.
2. **Nutritional supplementation** – enteral and parenteral therapy.
3. **Diuretics** – Classification*, role of diuretics in acute renal failure and forced alkaline diuresis, site of action pattern of electrolyte excretion, short term and long term side effects and therapeutic uses.
4. **Antidiuretics** - Vasopressin (antidiuretic hormone) and vasopressin analogues)*

UNIT -IX

DRUGS ACTING ON THE BLOOD AND THE BLOOD FORMING ORGANS: 6 Hours

1. **Hematinics** (Iron, vitamin B12 & folic acid)*, minerals (trace elements) and vitamins and clinical significance, preparations, uses, treatment of iron deficiency anemia, disadvantages of shotgun antianemic preparations, megaloblastic anemia, iron poisoning. Erythropoietin* and other growth factors.
2. **Coagulants** – Vitamin K*, fibrinogen and styptics.
3. **Anticoagulants** – Classification* thrombolytics*, antifibrinolytics and sclerosing agents
4. **Plasma expanders and blood transfusion** - Chemistry, pharmacokinetics, preparations, dosage and uses, adverse effects.
5. **Drugs induced blood dyscrasias.**
6. **Drugs used in the management of shock.**

UNIT - X

DRUGS ACTING ON RESPIRATORY SYSTEM: 3 Hours

1. **Drugs for cough** – Classification * Principles of choosing appropriate cough remedies, expectorants, mucolytics, antitussives, preparations and uses.
2. **Drugs for bronchial asthma** – Classification*, Principles governing the selection of drugs in bronchial asthma, inhaled asthma medication, precautions to be taken during their use. Management of acute attacks, prophylaxis and status asthmaticus.

*** mechanism of action, pharmacological actions, adverse drug reactions, precautions, contraindications, preparations, drug interactions, therapeutic uses/indications.**

UNIT - XI

HORMONES AND HORMONE ANTAGONISTS: 12 Hours

1. **Hormones** – Definition, different types and their mechanism of action.
2. **Anterior pituitary hormones** – Regulation of secretion, preparations and uses. Importance of drug induced alterations in prolactin levels.
3. **Thyroid hormones** – Levo thyroxine*, antithyroid drugs*- classification, preparations and uses.
4. **Antidiabetic drugs** – Insulins – Actions conventional preparations, highly purified preparations, reactions, uses, newer insulin delivery devices. Oral hypoglycemic drugs*- classification, management of hypoglycemia, diabetic ketoacidosis.
5. **Glucagon** – actions, uses.
6. **Corticosteroids** – regulation of secretion, preparations*, Glucocorticoid antagonists.
7. **Gonadal hormones** – Androgens*, anabolic steroids – preparations, side effects, uses, antiandrogens – side effects, uses. Estrogens – preparations*, hormonal replacement therapy, antiestrogens*, selective estrogen receptor modulators. Progestins – Preparations*, antiprogestins – (Mifepristone) hormonal contraceptives – types of methods, (oral, injectable), preparations*, male contraceptive.
8. **Drugs acting on uterus** – uterine stimulants- classification, (Oxytocin*, Ergometrine*, Prostaglandins). uterine relaxants – Preparations*.
9. **Drugs affecting calcium balance**: Calcium parathyroid hormone, calcitonin, Vitamin D, preparations, uses. Bisphosphonates – actions, uses, Pharmacotherapy of osteoporosis.

UNIT - XII

GASTRO INTESTINAL DRUGS: 6 Hours

1. Drugs used for the control of gastric acidity, digestants, antiflatulents.

Drug treatment of peptic ulcer* - classification (H₂ blockers*, proton pump inhibitors*, prostaglandin analogs, antacids, ulcer protectives).

Treatment of helicobacter pylori infection.

2. Emetics, antiemetics*, prokinetic drugs - Classification*, mechanism of action, actions, adverse drug reaction, uses & drug interactions.

Treatment of gastroesophageal reflux disease.

3. Drug treatment of gallstones.

4. Agents used for constipation - classification, laxatives, purgatives and hazards of purgatives.

5. Drugs used in diarrhoea - indications for the use of antimotility agents*, antimicrobial agents and antisecretory agents and oral rehydration powder. Drugs used in therapy of inflammatory bowel disorders.

* **mechanism of action, pharmacological actions, adverse drug reactions, precautions, contraindications, preparations, drug interactions, therapeutic uses/indications.**

UNIT - XIII

CHEMOTHERAPY OF MICROBIAL DISEASES: 18 Hours

1. General principles of chemotherapy, antibiotics - definition, sources, chemical nature, mechanism of action, (spectrum of activity, type of action, problems. Toxicity, hypersensitivity reactions, drugs resistance - types, mechanisms, prevention of super infection. Factors determining the choice of an antibiotic, minimum inhibitory concentration (MIC), post antibiotic effect (PAE), minimum bactericidal concentration (MBC). Combinations of Antimicrobials - Advantages, disadvantages, indications.

Prophylactic use of Antimicrobials - indications with examples, causes for the failure of chemotherapy.

2. Sulfonamides* - preparations, cotrimoxazole*

3. Quinolones* - classification- first generation, Second generation. Drugs used in typhoid fever.

4. Beta lactum antibiotics: classification,

Penicillins* (including semisynthetic, Acid resistant, penicillinase resistant, Extended spectrum), Beta lactamase inhibitors,

Cephalosporins*, monobactams*, carbapenems*.

5. Tetracyclines* and chloramphenicol*.

6. **Aminoglycosides***- classification.
 7. **Macrolide* and miscellaneous antibiotics** –classification, newer macrolides*, clindamycin, Lincomycin, vancomycin, Teicoplanin, Linezolid, Fusidic acid, Polymyxin B, Bacitracin, Tyrothricin – Spectrum and uses.
 8. **Pharmacotherapy of urinary tract infection, urinary antiseptics,**
 9. **Pharmacotherapy of sexually transmitted diseases.**
 10. **Antitubercular drugs*** –classification, first line drugs*,
 11. **Second line drugs, newer drugs,** antitubercular drug regimens, management of Adverse Drug Reaction with antitubercular drugs, chemoprophylaxis, tuberculosis in AIDS, pregnancy, breast feeding, drugs used in Atypical Mycobacteriae.
 12. **Antileprotic drugs*** - Classification, Pharmacotherapy, drug regimen (MDT), Alternative regimens, management of lepra reactions, newer drugs.
 13. **Antifungal drugs:** Classification*, local, systemic mycoses management.
 14. **Antiviral drugs:** classification, Anti-herpes virus drugs*, Anti-retrovirus drugs*, WHO guidelines for the treatment of HIV infection, anti influenza virus drugs*, nonselective antiviral drugs*.
 15. **Anti malarial drugs*:** Classification, different forms of anti malarial therapy, management of cerebral malaria, radical cure, malaria prophylaxis, resistant malaria.
 16. **Antiamoebic drugs:** Classification*, drugs for giardiasis.
 17. **Drugs for trichomoniasis,**
 18. **Drugs for leishmaniasis (kalazar).**
 19. **Anthelmintics:** classification*, choice of drugs for various worm infestation.
 20. **Antifilarial drugs*.**
- *_Chemistry, spectrum of activity, mechanism of action, Pharmacokinetics, Preparations, adverse effects, interactions, precautions, uses.**

UNIT - XIV

CHEMOTHERAPY OF NEOPLASTIC DISEASES: 3 Hours

Anticancer drugs: Classification, general toxicity, general principles in chemotherapy of malignancy, cell cycle, toxicity amelioration.

UNIT - XV

DRUGS USED FOR IMMUNOMODULATION: 2 Hours

1. **The immune response**

General principles of immunosuppressive therapy, immunosuppressants*,

Immunostimulants - BCG, Peptides, Immunoglobulins, Cytokines

(Interferon - α , Interleukin-2, Levamisole).

2. **Immune mechanism and drug allergy.**

UNIT - XVI

TOXICOLOGY: 3 Hours

1. **Heavy metals and antagonists** – Lead, Arsenic, cadmium, Mercury poisoning and Management.
Antagonists* (eg- dimercaprol)
2. **General Principles of treatment of acute poisonings-** clinical assessment, Emergency stabilization, active removal of toxin, methods to increase elimination of toxic agents, plasma exchange and exchange transfusion.
3. **Nonmetallic environmental toxicants and occupational toxicology:**
Air pollution by Carbon monoxide, Hydrogen sulphide, Sulphur dioxide, Nitrogen dioxide.
4. **Management of over dosage** with commonly used therapeutic agents.
5. **Bio medical waste** – types, potential risks and their safe management.

UNIT - XVII

DERMATO PHARMACOLOGY: 1 Hour

1. **Skin and mucous membrane (dermatological pharmacology)** Systemic treatment – Corticosteroids, antibiotics, antihistamines, Immunosuppressants – indications.

Topical treatment: Calamine lotion, creams, emollients, antifungal agents, Sunscreens - reflectors, absorbents – indication, advantages, disadvantages,

Pharmacotherapy of scabies and pediculosis.

UNIT XVIII

Ocular pharmacology: 1 Hour

UNIT XIX

GENE THERAPY - principles and uses: 1 Hour

UNIT XX

MISCELLANEOUS DRUGS:4 Hours

1. **Enzymes in therapy.**
2. **Antiseptics and disinfectants**, definition, indications, advantages and disadvantages
with examples in different groups.

3. **Vitamins and food supplements** *Vitamin B-complex - (B1 (thiamine), B2 (Riboflavin), B3 (nicotinic acid), B6 (Pyridoxine), biotin, Vitamin C*, Vitamin A*, Vitamin E*, Vitamin K*, zinc, spirulina, - indications.
 4. **Vaccines and sera typhoid vaccine**, hepatitis A, B vaccine, rabies vaccine, varicella vaccine, indications, dosage and administration, adverse effects, interactions, contraindications, special precautions.
- *Physiological functions, symptoms and signs of deficiency, preparations, hypervitaminosis, side effects, therapeutic uses.

Practical	Tutorial/assignment/ seminar	Problem based learning
Introduction to Pharmacology Practicals		
Routes of drug administration	Routes of drug administration & Special drug delivery systems	
Sources of drugs		
	Pharmacokinetics & pharmacodynamics	
Sources of drug information	Adverse Drug Reactions & Drug Interactions	
Dosage forms/ formulations		
Guidelines to the use of animals		
	Myasthenia gravis	Myasthenia gravis
	Pharmacotherapy of Glaucoma	Glaucoma
	Anticholinergic drugs	
Study of effects of drugs on rabbit eye - Pilocarpine/ Atropine/ Phenylephrine/ Lignocaine	Adrenergic and anti adrenergic drugs	
		Local Anaesthetics
Essential drug concept	Skeletal muscle relaxants & Local anaesthetics	
P-Drug concept		
Clinical Pharmacology charts	Autacoids	
	NSAIDs	
Effect of General Anaesthetics on		

Rat		
	General Anaesthetics	
Study of Skeletal muscle relaxation by diazepam in mice	Sedative - hypnotics	
	Psychopharmacology	
	Opioid analgesics & Antiepileptics	
	Drug therapy of heart failure	
Dosage Calculations		
	Pharmacotherapy of Hypertension	Hypertension
	Anti Arrhythmic & Drugs for myocardial ischemia	
	Diuretics & Anti Diuretics	
Problem solving exercises	Coagulants and Anticoagulants	
Prescription writing		Bronchial asthma
	Drugs Acting on Respiratory System	
Quantitative/Qualitative experimental charts		
	Hormones	
	Drugs acting on uterus	
Prescription Audit		
		Peptic Ulcer
	Drugs used in constipation and diarrhoea	
	Drugs Acting on GIT	
		Chemotherapy
Pharmacoeconomic problems		
	Sulfonamides & Quinolones	
	Beta lactum antibiotics, Tetracyclines and chloramphenicol	
	Pharmacotherapy of tuberculosis	
	Pharmacotherapy of Leprosy	
	Macrolides, anti fungal, anti viral drugs	
	Antimalarial & Antiamoebic	
	Chemotherapy of neoplastic diseases	
		Poisoning,

	Toxicology	
	Miscellaneous drugs	

INTEGRATED TEACHING

Common Areas Integrated Teaching Of Pharmacology In Collaboration With Pre, Para And Clinical Departments

Topics	Collaborating Departments
Drugs in Anaesthetic practice	Anaesthesia Surgery Ophthalmology
Drugs in Psychiatry	General medicine Psychiatry Pediatrics
Principles of rational use of drugs	Medicine Surgery Obstetrics & Gynaecology Pediatrics
Therapy of hypertension	Physiology Cardiology Medicine Pathology OB&G
Diabetes mellitus	Medicine Pathology OB&G Ophthalmology Surgery
Peptic Ulcer disease	Medicine Physiology Surgery
Congestive heart failure	Medicine Cardiology
Therapy of Bronchial asthma	Medicine

	TB & Chest medicine Pediatrics
Therapy of Malaria	Medicine Microbiology Community Medicine
Therapy of Tuberculosis	Medicine Microbiology Community Medicine Chest Medicine
Principles in the treatment of poisoning	Forensic Medicine Medicine

II M.B.B.S- DISTRIBUTION OF CHAPTERS IN THE UNIVERSITY XAMINATION

PAPER I

- 1) General pharmacology.
- 2) Pharmacology of ANS, Skeletal muscle relaxants, local anaesthetics.
- 3) Pharmacology of Autocoids.
- 4) Pharmacology of CNS, Local anesthetics and skeletal muscle relaxants.
- 5) Pharmacology of CVS.
- 6) Pharmacology of blood and blood formation.
- 7) Pharmacology of renal system.

PAPER II

- 1) Chemotherapy of microbial diseases.
- 2) Chemotherapy of malignancy.
- 3) Immunopharmacology
- 4) Endocrine system.
- 5) Pharmacology of respiratory system.
- 6) Pharmacology of GIT.
- 7) Oculo Pharmacology
- 8) Gene therapy
- 9) Miscellaneous: Drugs acting on skin and mucous membranes, toxicology, Antiseptics, disinfectants, ectoparasiticides, vitamins, enzymes in therapy, vaccines & sera.

UNIVERSITY PRACTICALS

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION

PRACTICAL - I

TOTAL - 80 MARKS

1. Prescription writing - 10 marks
2. Prescription audit/CCR (criticize, correct and rewrite the prescription) - 10 marks
3. Clinical problem solving exercise - 10 marks
4. Dosage calculation including pharmacoeconomic problems - 10 marks

PRACTICAL - II

1. Experimental pharmacology – (Animal Experiment) - 20 marks
2. Qualitative/Quantitative experimental charts - 10 marks
3. Clinical pharmacology charts – 10 marks

BOOKS RECOMMENDED

1. Pharmacology and Pharmacotherapeutics, R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure.
2. Essentials of Medical Pharmacology, K.D. Tripathi
3. Clinical Pharmacology, P.N. Bennett and M.J. Brown..
4. Basic and clinical Pharmacology, Katzung..

REFERENCE BOOKS:

1. Pharmacology, Rang. H.P (etal)..
2. Oxford textbook of clinical Pharmacology and drug therapy, Grahame – Smith D.G.
3. The Pharmacological basis of therapeutics, Goodman & Gilman's..
4. Modern Pharmacology with clinical applications, Craig, Charles R..
5. Lippincott's illustrated Reviews Pharmacology, Harvey, Richard A. Champe..
6. Integrated Pharmacology, Page, Clive et al..
7. Textbook of Pharmacology, S.D. Seth..

PATHOLOGY

HIGHLIGHTS:

The Curriculum has been designed as per MCI recommendations. Care has been taken to emphasize clinically oriented teaching of Pathology. The obsolete practical exercises have been eliminated and newer teaching methodologies like Problem Based Learning have been incorporated. An effort has also been made to give more emphasis to the interpretive aspects than technical aspects.

MCI has allocated approximately 300 hours for teaching Pathology over a period of three semesters. Of this, not more than 100 hours is recommended to be utilized for didactic teaching. The rest of the allocated hours are meant for practicals / integrated teaching and tutorials. These recommendations have been taken into consideration while designing the curriculum. The allocation of marks for summative examination and internal assessment is as per MCI recommendation.

1. Curriculum

The Theory component would comprise of 100 hrs of didactic teaching, which will be clinically integrated as far as possible. It was also decided to include a brief outline of each lecture so as to make the lectures uniform.

The practical classes will comprise of 120 hrs (60X2 hrs each) of exercises. It was decided to eliminate obsolete practical exercises and to concentrate on those tests, which can be performed by the house officers in the side lab and also on interpretation of values.

The exercises to be performed include smear study; estimation of Haemoglobin, Blood grouping/typing, urine analysis by strips and conventional methods, interpretation of charts, image quiz, slide and specimen demonstrations.

The time allocated for the tutorials is approximately 90 hrs. This will include Seminars, assignments and Problem Based Learning (PBL).

As a part of learning exercises and to promote self-study, Problem Based Learning (PBL), which is clinically integrated, is to be introduced. These will involve small group discussion and will be part of internal assessment. These will be conducted in three sessions of 2 hrs each.

2. DETAILED SYLLABUS:

INTRODUCTION

- ↯ Historical aspects; definition of terms; introduction to pathology, its applications and role in patient management
- ↯ Cellular responses to stress & noxious stimuli, cellular adaptation of growth & differentiation (hyperplasia, hypertrophy, atrophy & metaplasia)
- ↯ Cell injury and cell death (cause & mechanism of reversible & irreversible injury)
Morphology of cell injury (reversible & necrosis), examples of cell injury and necrosis (ischaemic , hypoxic, reperfusion and chemical injuries)
- ↯ Apoptosis and sub-cellular responses to injury
- ↯ Intracellular accumulation, calcification & cellular aging; (Lipid, protein, glycogen and pigment accumulation; pathologic calcification; ageing)

INFLAMMATION/ REPAIR

- ↯ Introduction to body's immune response (innate & adaptive immunity; cells and tissues of immune system; cytokines; structure & function of HLA)
- ↯ General features of inflammation; history; stimuli for acute inflammation; vascular events; cellular events - leucocyte adhesion and transmigration
- ↯ Continuation of cellular events (chemotaxis, phagocytosis, defects of leucocyte function); termination of acute inflammatory response; outcome of acute inflammation; morphological patterns of acute inflammation;
- ↯ Chemical mediators (vaso-active amines; plasma proteins; AA metabolites; PAF; cytokines; chemokines;leucotrienes; NO; free radicals & neuropeptides)
- ↯ Chronic inflammation (cause, morphological features; cells of chronic inflammation; granuloma; systemic effects of inflammation; consequences of excessive/ defective inflammation)
- ↯ Repair (healing; scar formation; cutaneous wound healing; healing at special sites; factors affecting wound healing)

HAEMODYNAMIC DISTURBANCES

- ↯ Oedema, hypotension, congestion, haemorrhage & haemostasis

- ✎ Thrombosis & embolism
- ✎ Infarction, Shock

GENETIC DISORDERS

- ✎ Normal karyotype; cytogenetic disorders (autosomal & X - chromosomal disorders)
- ✎ Mutation; Mendelian disorders (Transmission pattern, biochemical & molecular basis of single gene disease; principles of multifactorial inheritance)
- ✎ Genetic disorders affecting structural protein, receptor protein, enzymes and regulatory proteins; Single gene disease with non-classical inheritance (mitochondrial gene mutation, genomic imprinting, molecular diagnosis)

IMMUNITY

- ✎ Disorders of immunity - mechanisms of hypersensitivity
- ✎ Autoimmunity - SLE
- ✎ Rheumatoid arthritis, systemic sclerosis, Sjogren's MCD, Amyloidosis
- ✎ Primary & secondary immunodeficiency

NEOPLASIA

- ✎ Definition, nomenclature, biology of tumour growth, differences between benign & malignant tumours, tumour spread & epidemiology
- ✎ Molecular basis of neoplasia (essential alterations for malignant transformation, oncogenes, suppressor genes)
- ✎ Evasion of apoptosis; defects in DNA repair, telomerase and angiogenesis; invasion & metastasis; dysregulation of genes)
- ✎ Carcinogenesis (carcinogenic agents, molecular basis of carcinogenesis)
- ✎ Host defense, tumour immunity, clinical features, and laboratory diagnosis.

INFECTIOUS DISEASES

- ✎ General principles (categories, transmission & dissemination of microbes, mechanisms of microbial disease, immune evasion, infections in immunosuppressed hosts, tissue response to microbes)
- ✎ Pathology of common viral & bacterial infections (CMV, EBV, HPV, hepatitis viruses, gram positive & negative bacterial infections)
- ✎ Mycobacterial infections, - tuberculosis
- ✎ Leprosy, syphilis and others
- ✎ Fungal & parasitic infections

ENVIRONMENTAL/NUTRITIONAL

- ✎ Environmental diseases
- ✎ Nutritional diseases

INFANCY & CHILDHOOD DISEASE

- ✎ Congenital anomalies, birth weight, gestational age, birth injuries, perinatal infections, ARDS, necrotizing enterocolitis, foetal hydrops.
- Inborn errors of metabolism, SIDS, childhood tumours.

SYSTEMIC PATHOLOGY - DISEASES OF THE ORGAN SYSTEMS

RBC & BLEEDING DISORDERS

- ✎ Development of haematopoietic cells, bone marrow, classification of anaemia
- ✎ Anaemia of blood loss, Nutritional anaemias
- ✎ Anemia of chronic disease, aplasia, other forms of impaired production
- ✎ Haemolytic anaemia - classification, membrane defects, enzyme defects
Acquired haemolytic anaemia, polycythaemia
- ✎ Haemoglobinopathies - Hb S, E, C & thalassaemia
- ✎ Bleeding disorders - classification, disorders of platelets, coagulation disorders

WBC, LYMPH NODE, SPLEEN

- ✎ Non-neoplastic quantitative and qualitative disorders of leucocytes
- ✎ Leukaemia - classification, aetiology, acute leukaemias
- ✎ Chronic leukaemias, MDS, other chronic myelo-proliferative disorders including myelofibrosis
- ✎ Non - neoplastic disorders of lymph node, spleen & thymus; classification of lymphoma
- ✎ Hodgkin Lymphoma & NHL
- ✎ Non-Hodgkin lymphoma (cont d) & Plasma cell dyscrasias
- ✎ Blood bankin

BLOOD VESSELS

- ✎ Atherosclerosis and Hypertension
- ✎ Vasculitis, Congenital anomalies, aneurysms and tumours.

THE HEART

- ✎ Ischaemic heart disease & myocardial infarction
- ✎ Rheumatic fever
- ✎ Infective endocarditis; diseases of the pericardium
- ✎ Congenital heart disease, diseases of the myocardium, tumours, of the heart

THE LUNG

- ✎ Atelectasis , acute lung injury, ARDS, acute interstitial pneumonia
- ✎ COPD - emphysema, bronchial asthma, bronchiectasis

- ✧ Diffuse interstitial diseases (infiltrative, restrictive) – fibrosing diseases (mainly pneumoconiosis), sarcoidosis, pulmonary eosinophilia, smoking related diseases
- ✧ Pulmonary infections – Pneumonias
- ✧ Tumours of lung & Diseases of pleura

HEAD AND NECK

- ✧ Benign and malignant lesions of head and neck including oral cavity, salivary glands

GIT

- ✧ Oesophagus – Congenital anomalies, motor dysfunction, GERD and tumours
- ✧ Gastritis and Peptic ulcer
- ✧ Tumours of stomach
- ✧ Congenital anomalies of intestine, Malabsorption syndromes & Enterocolitis
- ✧ IBD – Crohn’s & Ulcerative colitis
- ✧ Tumours of small & large intestine, diseases of appendix & peritoneum.

LIVER BILLIARY TRACT

- ✧ General features of liver disease (patterns of hepatic injury, jaundice, portal hypertension, hepatic failure, liver function tests)
- ✧ Infectious diseases of liver
- ✧ Alcoholic liver disease, cirrhosis, metabolic liver disease
- ✧ Intrahepatic billiary tract lesions and tumours, diseases of gallbladder – cholecystitis, cholelithiasis, tumours.

PANCREAS

- ✧ Acute & chronic pancreatitis and tumours

KIDNEY

- ✧ Normal structures, congenital anomalies, cystic disease, laboratory tests in renal disease
- ✧ Nephritic Syndrome – pathogenesis and pathology
- ✧ Nephritic Syndrome – pathogenesis and pathology
- ✧ Diseases of tubules and interstitium, diseases of blood vessel, urolithiasis, hydronephrosis
- ✧ Tumours of the kidney, renal pelvis and urinary bladder

MALE GENITAL TRACT

- ✧ Congenital anomalies & tumours of penis, BPH & tumours of prostate

- ✧ Testis – infertility, atrophy, tumours

FEMALE GENITAL TRACT

- ✧ Infections of FGT, lesions of vulva and vagina, Diseases of cervix
- ✧ Endometrium – DUB, inflammation, endometriosis, adenomyosis, endometrial hyperplasia and polyps , tumours of endometrium, myometrium and fallopian tube
- ✧ Ovary – non – neoplastic lesions of ovary, classification & pathology of ovarian tumours
- ✧ Diseases of placenta

BREAST

- ✧ Benign lesions of the breast
- ✧ Malignant lesions of the breast

ENDOCRINE SYSTEM

- ✧ Diseases of pituitary gland, parathyroid, pineal gland & MEN
- ✧ Benign & malignant lesions of thyroid
- ✧ Diseases of Adrenals
- ✧ Diabetes mellitus

SKIN

- ✧ Diseases of the skin

BONE & JOINTS

- ✧ Infections, metabolic disease of bone
- ✧ Bone tumours
- ✧ Diseases of joints

SOFT TISSUE & MUSCLE

- ✧ Diseases of soft tissue & muscle

CNS & SPECIAL SENSES

- ✧ Infections, degenerative disorders of CNS, CSF analysis
- ✧ Tumours of brain & spinal cord
- Special senses

Practical Exercises

1. Histopathology/cytology slides – spotters
2. Gross specimens – spotters
3. Haematology slides – spotter
4. Description of slides and specimens

5. Image Quiz
6. Haemoglobin estimation
7. Peripheral smear staining & differential count
8. Blood grouping/typing
9. Blood and bone marrow charts
10. Urinalysis (using reagents and urine strips)
11. Instruments - spotters
12. Demonstrations
 - a. Specimens and instruments
 - b. ESR
 - c. PCV
 - d. Osmotic fragility
 - e. BT/CT/PT/APTT
 - f. Cell counter

BOOKS RECOMMENDED

1. General and Systematic Pathology by J C . Underwood.
2. Pathology by Rubin and Faber
3. Basic Pathology by Robbins
4. Pathologic Basis of the Disease by Robbins
5. Text book of Haematology by Shirley Mckenzie
6. Essential Haematology by A V Hoffbrand

MICROBIOLOGY

CURRICULUM

Goal

The broad goal of the teaching of undergraduate students in Microbiology is to provide an understanding of the natural history of infectious diseases in order to deal with the etiology, pathogenesis, laboratory diagnosis, treatment, control and prevention of infections in the community.

Objectives

Knowledge

At the end of the course the student will be able to:

- i) state the infective micro-organisms of the human body and describe the host - parasite relationship.
- ii) list the pathogenic microorganisms (Bacteria, Viruses, Parasites, Fungi) and describe the pathogenesis of the diseases produced by them.
- iii) state or indicate the modes of transmission of pathogenic and opportunistic organisms and their sources including insect vectors responsible for transmission of infection.

- iv) describe the mechanisms of immunity to infections.
- v) acquire knowledge on suitable antimicrobial agents for treatment of infections and scope of immuno therapy and different vaccines available for prevention of communicable diseases.
- vi) apply methods of disinfection and sterilization to control and prevent hospital and community acquired infections.
- vii) recommend laboratory investigations regarding bacteriological examination of food, water, milk, and air.

Skills

At the end of the course the student will be able to:

- i. operate and use the light compound microscope.
- ii. to employ aseptic and sterile precautions while performing simple invasive procedures such as venepuncture etc.
- iii. collect and transport appropriate clinical materials with necessary precautions for the laboratory diagnosis of infectious diseases.
- iv. to perform common laboratory techniques (as given below) for the direct demonstration of micro-organisms from clinical materials and interpret their findings.
 - o Wet preparation for *Trichomonas vaginalis*.
 - o KOH preparation for the identification of fungal elements.
 - o Saline and iodine preparations and concentration methods for parasites and demonstration of trophozoites, ova or cysts in stool samples.
- v. prepare and stain peripheral blood for screening malarial parasites and microfilariae.
- vi. prepare a smear and perform Gram stain on body fluids, urine and pus specimens.
- vii. prepare a smear and perform Ziehl - Nielsen stain for demonstration of *Mycobacteria* especially from sputum.
- viii. perform and interpret cold staining techniques on skin smear for demonstration of *M. leprae*.
- ix. interpret results of microbiological tests including antimicrobial testing for the diagnosis of common infectious diseases.
- x. to perform and interpret a skin test.
- xi. perform simple standard rapid tests for diagnosis of infectious diseases.
- xii. to organize the safe handling and disposal of infectious waste.

Integration

The student will have integrated knowledge of Infectious diseases - pathogenicity, clinical features, immunological features, laboratory diagnosis, epidemiology and control of diseases in the community by proper immunization

procedures. This will be achieved through integrated teaching involving other non clinical and clinical departments.

DETAILED SYLLABUS

I. General Microbiology

Historical introduction

Contribution of various scientists to Microbiology
Discovery of various pathogenic bacteria and viruses
History of vaccination, Immunology, Antimicrobials
Emerging and Re-emerging Infectious diseases

Microscopy

Principle, components, specifications, advantages and disadvantages and use in diagnostic Microbiology.
The Light Microscope, Dark ground Microscope, Phase Contrast Microscope, Fluorescent Microscope and Electron Microscope.
Specialized types of Microscopes- Interference microscope, Polarization microscope. Recent advances in Microscopy.

Staining of bacteria

Simple stains, Negative staining, Impregnation staining
Differential staining - Gram stain, Acid fast stain
Special stains - Albert's stain, Wayson's bipolar staining

Bacterial morphology

Shape and arrangement of Bacteria
Structure of Bacterial cell
Nutrition and growth of bacteria
Growth and Multiplication of Bacteria
Bacterial growth curve
Bacterial nutrition - nutrients required for bacterial growth
Oxygen requirement, Carbon dioxide requirement, Temperature requirement
Effects of Moisture, H-ion concentration, Light, Osmotic effect and Mechanical stress on Bacterial growth

Culture media and cultivation of bacteria

Basic requirements of culture media
Types of Media

Identification of bacteria and bacterial classification

Morphology, staining reactions, culture characteristics
Biochemical reactions
Serotyping, phage typing, pathogenicity testing
Bacterial classification - the species concept in bacteria, phylogenetic classification, Adansonian classification, molecular or genetic classification, intra-species classification
Nomenclature-casual name and scientific name

Bacterial genetics

Basic principles of molecular biology
Bacterial DNA
Extra-chromosomal genetic elements-plasmids, episomes
Genotypic and phenotypic variations
Mutations
Transmission of genetic material - Transformation, Transduction, Lysogenic conversion, Conjugation
Plasmids - F factor, Col factor, Resistance transfer factor
Genetic mechanisms of drug resistance in bacteria
Transposable genetic elements
Genetic engineering

Sterilization and Disinfection

Definitions - sterilization, disinfection, antiseptics
Physical agents- Dry heat, moist heat, Filtration, Radiation
Chemical agents - Alcohols, Aldehydes, Phenolics, Chlorine compounds, others .
Sterilization control - Physical, chemical, biological indicators
Characteristics of ideal disinfectant
Factors affecting potency of disinfectants
Testing of disinfectants
Application of knowledge of sterilization and disinfection in clinical practice

Microbial control

History of discovery of antibiotics
Classification of Antibiotics based on mechanism of action
Mechanism of action of different Antibiotics - Penicillin, Synthetic penicillins Macrolides, Aminoglycosides, Carbapenams, Monobactam, Cephalosporins Glycopeptides
Antibiotic susceptibility testing - Kirby- Bauer method, Stokes method, MIC
Antifungal agents, Antiviral agents, Chemotherapy of parasitic infections

Normal Microbial flora

Commensals, pathogens

Colonization, Infection

Normal flora of different sites – Skin, oral cavity, upper respiratory tract, conjunctiva, gut, ear, nose, vagina

Microbial pathogenicity and immunity

Classification of infection

Sources of infection in man

Methods of transmission of infection

Factors predisposing to microbial pathogenicity

Exotoxins and Endotoxins

Types of infectious diseases

Innate and Acquired immunity

II. Immunology

Structures and functions of immune system

Introduction and Definitions

Central lymphoid organs

Peripheral lymphoid organs

Cells of Lympho-reticular system

Phagocytic cells – blood macrophages and tissue macrophages, functions,

Microphages – neutrophils, basophils and eosinophils

Cells of immune system

T lymphocytes and subsets

B lymphocytes

Distinguishing characteristics of T cells, B cells and Macrophages

Killer cells

Natural killer cells

Null cells

Phagocytic cells – Macrophages and Microphages

Immune response / immunity

Introduction

Humoral immune response – primary and secondary responses, fate of antigen in tissues, antibody production – polyclonal and monoclonal antibodies, monoclonal antibody – production and application, Factors influencing antibody production.

Cellular immune response – Scope of CMI, induction of CMI, lymphokines and Interleukins, detection of CMI, transfer factor.

Interactions between cellular and humoral immune responses

Immunological tolerance

Theories of immune response

Antigen

Definitions of Antigen, hapten, pro antigen, antigenic determinant etc
Determinants of antigenicity –
Isospecificity, autospecificity, organ specificity, heterogenetic specificity

Antibody

General characteristics
Structure of immunoglobulin
Immunoglobulin classes
Properties of the different immunoglobulins
Abnormal immunoglobulins
Immunoglobulin specificities

The complement system

Introduction and Definition
Components of Complement
Classical pathway – activation, sequence of events
Alternate pathway – activation, the Complement cascade, reaction sequence,
components, biological activity of released fragments
Regulation of Complement activation
Biological effects of Complement
Clinical syndromes associated with genetic deficiency of Complement components
Quantification of Complement and Components of Complement

Antigen antibody reactions

Introduction and definitions
General feature of Antigen Antibody reactions
Measurement of antigen and antibody
Precipitation reaction – characteristics and definition
Mechanism of precipitation
Applications of precipitation reactions
Electroimmunodiffusion – countercurrent immunoelectrophoresis and Rocket electrophoresis

Agglutination reactions

General features
Applications of agglutination reaction

Complement fixation tests

- General features
- Complement fixation test - principle, methodology and applications
- Indirect Complement fixation test
- Other Complement depending serological tests
- Neutralization tests** -Virus neutralization and toxin neutralization
- Opsonisation** - Opsonins and Opsonisation
- Immunofluorescence** - Principle, fluorescent dyes, applications
- Radioimmunoassay** - Principle, radioactive elements used, application
- ELISA** - Principle, application, types of ELISA
- Immune Electronmicroscopy**
- Hypersensitivity**
 - Introduction and definitions
 - Classification of Hypersensitivity reactions
 - Distinguishing features of immediate and delayed types of hypersensitivity
 - Type 1** - hypersensitivity
 - Atopy - definition, mechanism and characteristics
 - Type 2** - Hypersensitivity - mechanism and features
 - Type 3** - Hypersensitivity - mechanism, Arthus reaction and Serum sickness
 - Type 4** - Hypersensitivity - mechanism, Tuberculin type and contact dermatitis type.

Auto immunity

- Definition and introduction
- Characteristics of Autoimmune disease
- Mechanisms of autoimmunization
- Classification of Autoimmune diseases - Hemocytolytic, Localized and Systemic
- Clinical features of various autoimmune diseases.
- Pathogenesis of autoimmune diseases

Major Histocompatibility complex

- Introduction
- The HLA Complex and HLA antigens
- HLA typing
- MHC restriction
- Clinical application of the knowledge of HLA typing

Transplantation immunology

- Introduction
- Classification of transplants
- Terminology of grafts
- The allograft reaction - description and mechanism

Histocompatibility antigens
Factors favouring allograft survival
Graft vs Host reaction

Tumor Immunology

Introduction
Clinical evidence of immune response in malignancy
Tumor antigens
Immune response in malignancy
Immunological surveillance
Immunotherapy of cancer

Immunodeficiency diseases

Introduction and classification of immunodeficiency diseases
Primary and Secondary immunodeficiencies
Cellular immunodeficiencies
Combined immunodeficiencies - various syndromes
Disorders of Complement
Disorders of phagocytosis - various syndromes

Immunohaematology

Introduction
Various blood group systems

Immunoprophylaxis against infectious diseases

Introduction
Active immunization - All vaccines currently used
Passive immunization - Anti sera, pooled normal human immunoglobulin, Specific immunoglobulins
Immunization schedule
Vaccination requirements for health care workers
Vaccination requirements for international travel
Vaccination for immunosuppressive individuals and pregnant women.
EPI and UPI

III. SYSTEMATIC BACTERIOLOGY

Classification, Morphology, Culture characteristics, Biochemical reactions, Virulence factors, Pathogenicity and Diseases caused by Bacterial pathogens and epidemiology, Lab diagnosis, Treatment and prevention of infections caused by them

1. Staphylococcus - S. aureus, S. epidermidis, S. saprophyticus, Micrococci

2. Streptococcus – Groups A, B, C, D, G, Enterococci, S.pneumoniae, viridans streptococci
3. Neisseria- Neisseria meningitides, Neisseria gonorrhoeae, Commensal Neisseria, Moraxella catarrhalis
4. Corynebacteria - Corynebacterium diphtheria, other pathogenic Corynebacteria, Diphtheroids
5. Bacillus - Bacillus anthracis, Anthracoid bacilli, Bacillus cereus
6. Clostridium - Clostridium perfringens, Clostridium septicum, Clostridium oedematiens, and Clostridium histolyticum, Clostridium tetani, Clostridium botulinum, Clostridium difficile
7. Non - sporing anaerobes - The anaerobic gram positive and gram negative cocci, anaerobic gram positive and gram negative bacilli
8. Mycobacteria - Mycobacterium tuberculosis, RNTCP, Atypical Mycobacteria Mycobacterium leprae
9. Actinomycetes and Nocardia
10. Escherichia coli – EPEC, ETEC, EIEC, EHEC,
11. Klebsiella
12. Proteus
13. Salmonella – S. typhi, S.paratyphi A, B, C, S. typhimurium and other gastroenteritis - causing Salmonella
14. Shigella - Shigella dysenteriae, Shigella boydii, Shigella flexneri, Shigella sonnei
15. Yersinia - Yersinia pestis, Yersinia pseudotuberculosis, Yersinia enterocolitica
16. Pasteurella and Francisella- Pasteurella multocida, Francisella tularensis
17. Hemophilus - Hemophilus influenzae, Hemophilus aegypticus, Hemophilus ducreyi, Hemophilus parainfluenza, Gardnerella vaginalis
18. Bordetella - Bordetella pertussis, Bordetella parapertussis and Bordetella bronchiseptica
19. Brucella – melitensis, abortus, suis
20. Vibrios -Vibrio cholera – classical and El tor, Halophilic Vibrios – Vibrio parahemolyticus, Vibrio alginolyticus, and Vibrio vulnificus, Aeromonas and Pleisiomonas
21. Campylobacter - Campylobacter jejuni, Campylobacter fetus, Campylobacter pylori
22. Pseudomonas - Pseudomonas aeruginosa, Other Pseudomonas- Pseudomonas mallei and Pseudomonas pseudomallei, Stenetrophomonas altophilia, Burkholdaria cepacia
23. Spirochaetes - Borrelia – B.recurrentis, B. vincenti, B. burgdorferi Leptospira and Treponema
24. Rickettsiae, Typhus fever group – Epidemic and Endemic typhus Spotted fever group, Scrub typhus, Trench fever, Q fever Bartonella bacilliformis – characteristics and infection caused

25. Chlamydia - Chlamydia trachomatis, Chlamydia pneumoniae
26. Mycoplasma and Ureaplasma
27. Miscellaneous bacteria, Listeria monocytogenes, Legionella pneumophila, Eikenella corrodens, Erysipelothrix rhusiopathiae, Acinetobacter, Flavobacterium, meningosepticum, Streptobacillus moniliformis, Calymmatobacterium, granulomatis, Cardiobacterium, hominis, Chromobacterium violaceum.

IV. PARASITOLOGY

1. General introduction

- History
 - Parasitism - description, definitions
 - Outline of sources of infections
 - Outline of modes of infection
 - Course of infection
 - Pathogenesis
 - Immunity in parasitic infections
 - Classification
2. Classification, geographical distribution, Morphology, Life cycle, reproduction, Reservoirs, definitive host, intermediate host, pathogenicity and clinical features, lab diagnosis, treatment, prophylaxis of infestation / infection due to

1. Protozoa

- a) Amoebae - Entamoeba histolytica, other intestinal Amoebae, Pathogenic free living Amoebae - Acanthamoeba and Naegleria Blastocystis hominis.
- b) Flagellates - Intestinal and Haemoflagellates, Intestinal flagellates - Giardia lamblia, Trichomonas vaginalis, other, intestinal flagellates - morphology and clinical significance, Haemoflagellates - Trypanosomes - African and South American, Trypanosomiasis. Leishmania - Leishmania donovani, Old world cutaneous, leishmaniasis and New world cutaneous leishmaniasis.
- c) Malarial parasites, Geographical distribution, life cycle - ring forms, trophozoites, schizont, and gametocytes, Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale Culture of malarial parasites Pathogenesis and clinical features, recrudescence and relapse, Complications of malaria - Blackwater fever, malignant tertian malaria, Cerebral malaria.

- d) Miscellaneous Sporozoa and Microspora, *Toxoplasma gondii*, *Sarcocystis*, *Isospora*, *Cryptosporidium*, *Cyclospora*, *Microsporidia*, *Babesia*, *Prototheca*,
- e) Ciliate Protozoa - *Balantidium coli*.

2. Helminths

- a) Trematodes - Flukes, Blood flukes: Schistosomes - *S. hematobium*, *S. mansoni*, *S. japonicum*, Liver flukes: *Clonorchis sinensis*, *Fasciola hepatica*, *Dicrocoelium dendriticum*, Intestinal flukes: *Fasciolopsis buski*, *Heterophyes*, *Metagonimus yokogawai*, *Gastrodiscoides hominis*, Lung flukes: *Paragonimus westermani*.
- b) Cestodes - Tapeworms, *Diphyllobothrium latum*, Sparganosis, *Taenia saginata*, *Taenia solium*, *Echinococcus granulosus*, *Echinococcus multilocularis*, *Hymenolepis nana*, *H. dimunita*, *Diylidium caninum* and *Coenurosis*.
- c) Nematodes, *Trichenella spiralis*, *Trichuris trichura*, *Strongyloides stercoralis*, Hookworms - *Ancylostoma duodenale*, *Necator americanus*, other Hookworms. *Trichostrongyliasis*, Pinworm - *Enterobius vermicularis*, Round worm - *Ascaris lumbricoides*, other roundworms - *Toxocariasis*.
- d) Filarial worms, Lymphatic filariasis - *Wuchereria bancrofti*, *Brugia malayi*, Subcutaneous filariasis - *Loa Loa*, *Onchocerca volvulus*, *Mansonella streptocerca*, Serous cavity filariasis - *Mansonella ozzardi*, *Mansonella perstans*.
- e) Guinea worm, *Dracunculus medinensis*.
- f) Miscellaneous nematodes, *Angiostrongylus cantonensis*, *Capillaria philippinensis* *Gnathostoma spinigerum*, *Anisakiasis*, *Larva migrans* - cutaneous and visceral.

3. Diagnostic methods in Parasitology

Examination of feces - wet mounts, thick smears, stained smears, concentration methods - floatation and sedimentation methods, fecal, culture Examination of blood - thin and thick smears for malarial parasite, Examination for microfilaria, Culture methods - Ameba, Leishmania and Trypanosomes, Malarial, parasite, Animal inoculation and xenodiagnosis, Immunological diagnosis - serology and skin tests.

V. GENERAL VIROLOGY

1. Morphology of Viruses
2. Replication of viruses
3. Cultivation of viruses
4. Classification of viruses

5. Assay of viruses
6. Quantitative and Quantal assays
7. Genetics of viruses
8. Identification of viruses and lab diagnosis
9. Pathogenesis and Host response to viral infections
10. Immunity in virus infections
11. Immunoprophylaxis, Chemoprophylaxis and chemotherapy
12. Bacteriophage - Morphology, Life cycle, Phage assay, phage typing, bacteriocins

VI. SYSTEMATIC VIROLOGY

Classification, general characteristics, morphology, physical and chemical properties, antigenic structure, cultivation and epidemiology, pathogenesis, clinical features, lab diagnosis, treatment and prevention of infections caused by the following viruses

1. Poxviruses - Variola and vaccinia viruses, Small pox, Cow pox and milker's nodes
2. Orf, Molluscum contagiosum
3. Adeno viruses
4. Herpes viruses - Herpes simplex 1 and 2, Varicella zoster, Cytomegalovirus, Epstein Barr virus, HHV 6, HHV 7, HHV 8
5. Picornaviruses - Enteroviruses - Poliovirus, Coxsackieviruses, Echoviruses, Rhinoviruses
6. Orthomyxoviruses - Influenza viruses
7. Paramyxoviruses - Mumps virus, Parainfluenza viruses, Respiratory syncytial virus, Measles viruses, corona viruses
8. Arbo viruses, Group A arboviruses, Group B arboviruses- Mosquito borne and Tick, borne groups, Bunyaviridae, Orbivirus and Vesiculovirus
9. Rhabdo viruses - Rabies virus
10. Hepatitis viruses - Classification, Hepatitis A, Hepatitis B, Hepatitis C virus, Hepatitis D viruses, Hepatitis, E virus, other hepatitis causing viruses including HGV
11. Viruses causing diarrhea - Rota virus, Norwalk, Calici and Astro virus
12. Slow viruses, Group A- Visna and Maedi, Group B- Mink encephalopathy, Creutzfeldt-Jakob virus, Kuru, Group C-SSPE, Progressive multi focal leuco encephalopathy, Bovine spongiform encephalopathy, Prions
13. Oncogenic viruses, List of Oncogenic viruses (RNA and DNA), Mechanisms of viral oncogenesis, Oncogenes and chromosomal location
14. Miscellaneous viruses - Papova viruses-Parvoviruses, Rubella, Viruses.

VII. GENERAL MYCOLOGY

Introduction and classification, Definitions and terminologies, Methods of reproduction, Methods of cultivation, Pathogenesis and Lab diagnosis of mycotic infections, Economic importance and harmful effects of Fungi – Mycotoxins

VIII. SYSTEMATIC MYCOLOGY

1. Superficial Mycoses, Surface infections and cutaneous infections, Morphology, cultural characteristics of causative agents, pathogenicity, and lab diagnosis
2. Sub-cutaneous mycoses, Mycotic mycetoma, chromoblastomycosis, Sporotrichosis, Rhinosporidiosis and sub cutaneous phycomycosis
3. Systemic mycoses, Cryptococcosis, Blastomycosis, Paracoccidioidomycosis, Coccidioidomycosis, Histoplasmosis
4. Opportunistic mycosis, Aspergillosis, Mucormycosis, Penicilliosis, Candidiasis
5. Otomycosis, Oculomycosis
6. Antifungal agents

IX. APPLIED CLINICAL MICROBIOLOGY

1. Collection, transport and disposal of specimens
2. Organ specific infections
3. Central nervous system infections
4. Respiratory infections – Upper / Lower
5. Urinary tract infections
6. Gastro intestinal infections – acute / chronic
7. Infections of the eye, ear and skin
8. Infection of CVS
9. Systemic infections / Syndromes – PUO, Septicemias
10. Zoonotic infections
11. Microbiology of Environment (food, water, milk and air)
12. Hospital infections (Prevention and control)
13. Basic molecular biology in relation to diagnosis of infectious diseases
14. Bioterrorism

Topics For Integrated Teaching

1. Pyrexia of unknown origin- integration with internal medicine, pharmacology, pathology, biochemistry.
2. Rheumatic fever- integration with internal medicine, pharmacology, pathology, surgery, Community medicine.
3. Tuberculosis- internal medicine, pharmacology, pathology, surgery, Pediatrics, Radiology, Community medicine.
4. Pneumonia- paediatrics, internal medicine, pharmacology, pathology.
5. Syphilis-- internal medicine, pharmacology, pathology, Dermatology, Obstetrics and Gynecology.
6. Malaria- Paediatrics, internal medicine, Pharmacology, Pathology, Community medicine.

7. Meningitis- paediatrics, internal medicine, Pharmacology, Pathology, Biochemistry, Community medicine.
8. Jaundice - Internal medicine, Biochemistry, Pathology, Pediatrics, Surgery, Obstetrics and Gynecology, Community medicine.
9. Diarrhoea- Paediatrics, Internal medicine, Biochemistry, Community medicine.
10. HIV /AIDS

1. Bacteriology

1.1 Staining

- a. Smear preparation
- b. Staining techniques
- c. Grams stain
- d. Special Stains - Acids fast staining, Albert, Ponders and Capsule staining

1.2 Demonstration

- a) Aerobic and anaerobic culture methods
- b) Demonstration of culture media
- c) Demonstration of growth characteristics, biochemical characteristics,
- d) antibiotic susceptibilities and other special features of important bacteria
- e) Demonstration of sterilization techniques and their applications
- f) Demonstration of commonly used Disinfectants
- g) Demonstration of bacterial motility - Hanging drop / other methods
- h) Demonstration of antibiotic susceptibility testing

1.3 Applied Exercises

Systematic - Identification of the pathogen from the given clinical material based on staining property, cultural characters, biochemical and serological tests - in the context of clinical syndromes.

2. Immunology

2.1 Demonstration of different types of Antigen Antibody reactions

- a. Agglutination - slide, tube and passive agglutination.
- b. Flocculation - VDRL
- c. Precipitation - Gel diffusion
- d. Complement fixation test
- e. Tagged immunoassays - ELISA and Immunoblot assays

2.2 Applied Exercise

Interpretation of the given immunological tests in the context of clinical syndromes.

3. Mycology

3.1 Staining/microscopy

- a. Lactophenol cotton blue stain
- b. Gram's Stain for Candida

3.2 Demonstration

Identification of the given fungus by cultural morphology and wet mount preparation / staining

3.3 Applied Exercise

Identification, interpretation and discussion on the given fungus in the context of clinical syndromes

4. Virology

4.1 Demonstration of

- a. Different methods of cultivation of viruses
- b. CPE in cell cultures
- c. Inclusion bodies

4.2 Serodiagnosis of viral infection

CFT, HAI, ELISA

4.3 Applied Exercise

Identification, interpretation and discussion on the given virus in the context of clinical syndromes

5. Parasitology

Microscopy

Stool examination for ova and cyst - saline and iodine preparation

5.2 Demonstration

- a) Concentration techniques - Flootation & sedimentation techniques
- b) Demonstration of malarial parasite - different species and stages
- c) Demonstration of Microfilariae
- d) Demonstration of histopathological specimens - Amebic ulcers in
- e) Intestine, Amebic liver abscess, Hydatid cyst

Applied Exercises

Identification of parasites (Adult and larval forms) and discussion in the context of clinical syndromes.

SYSTEMS COVERED

PAPER - I

- a) General Bacteriology - Sterilization
- b) General Bacteriology - Genetics
- c) Immunology - Anatomy and normal functions in Vivo and in Vitro
- d) Immunology - in diseases
- e) Systematic Bacteriology - Obligate bacteria
- f) Systematic Bacteriology - facultative bacteria

PAPER - II

Parasitology

Virology
Mycology
Applied Microbiology

BOOKS RECOMMENDED

1. Text book of Microbiology – Ananthanarayanan and Jayaram Panicker
2. Text Book of Microbiology By Prof. C.P. Baveja
3. Text book of medical Parasitology – Jayaram Panicker
4. Medical Parasitology – By Prof. C.P. Baveja

REFERENCE BOOKS

- ❖ Medical Microbiology – Vol 1 Greenwood, Vol II Maekie and Mleartney
- ❖ Medical Microbiology by Jawetz
- ❖ Essential Immunology - Ivon M. Roitt
- ❖ Immunology – Kubly

JOURNALS FOR REFERENCE

- Journal of Medical Microbiology, Lippincott
- Journal of Clinical Microbiology, The American Society for microbiology
- Indian Journal of Medical Research (ICMR)

FORENSIC MEDICINE

CURRICULUM

(i) Goal

The goal of teaching Forensic medicine to undergraduate students is to impart knowledge of legal procedures involved in medical practice and to apply the knowledge of medical science for the purpose of ensuring justice in courts of law. Further the teaching will help the students to know of medical ethics and etiquette to be followed during the practice of medicine. As it is a well known fact that the medical service become vulnerable to be criticized day to day by the litigatory society, a medical student should be prepared to practice medicine

without being entangled either by professional, criminal or consumer law. Hence the knowledge in forensic medicine is most essential and useful and it can be gained only during their studentship.

(ii) Objectives

(A) Knowledge

At the end of the course the student will be able to

- (a) appear in a Court of law as a Registered Medical Practitioner and give evidence in cases of homicide, assault, sexual offences, alcoholic intoxication, drug dependence and other cases requiring medical opinion.
- (b) practice medicine in the society following medical ethics and etiquette as prescribed by the Medical Council of India.

(B) Skills

- (a) to conduct autopsy on medico-legal cases and issue postmortem certificates; to examine cases of wounds (assault, homicide etc.,) at the hospital and issue required medico-legal certificates (wound certificates).
- (b) to treat cases of poisoning and issue certificates to the court and the police.

(C) Integration

The student will be able to integrate and apply his/her knowledge of anatomy, physiology, biochemistry, pathology, microbiology, medicine, surgery and obstetrics and gynecology for the purpose of legal procedures and execution of justice.

Detailed Syllabus

1. Introduction; History; legal procedures in India; medical and medico legal documents; evidences, witnesses; types and powers of Court; laws related to medical profession.
1. Historical aspects of medical ethics and Medical Council of India, State Medical Council: structure, functions, powers; duties of medical practitioners towards patients and relatives, State, teachers and colleagues; consent: definition, types, application in medical practice; medical negligence: civil, criminal; Consumer Protection Act: rights and liabilities of doctors, medical indemnity insurance; human rights and violation; duties of medical practitioners to victims of torture; Human organ transplantation Act.
2. Identification of the living and the dead.
3. Forensic thanatology; death; causes of death; mechanism and manner of death; changes after death; artifacts; medicolegal death investigation; exhumation.

4. Traumatic pathology; general aspects and classification; mechanical injuries; regional injuries; thermal injuries; injuries due to electricity, lightning and radiation; train and road traffic accidents; firearm and explosion injuries; medicolegal aspects of wounds.
5. Asphyxia; general aspects; patho-physiology and classification; mechanical asphyxia; hanging; strangulation; drowning; smothering, choking, garroting, burking, yoking.
6. Sexual jurisprudence; virginity, pregnancy, delivery, assisted pregnancy; impotence, sterility, artificial insemination; medical termination of pregnancy; Prenatal sex determination Act; abortion; infanticide; child abuse; S.I.D.S (sudden infant death syndrome) ; sexual offences.
7. Forensic science; Locard's exchange principle; lie detector; superimposition; D.N.A. finger printing.
8. Toxicology; general aspects and classification; corrosive poisons; irritant poisons; neural poisons; somniferous; inebriant; deliriant; spinal; peripheral; cardiac poisons; asphyxiants; miscellaneous; drug abuse.

RECOMMENDED BOOKS

- Narayanareddy K. S., The Essentials of Forensic Medicine & Toxicology, Published by K. Sugana Devi, Hyderabad.
- Apurbanandy, Principles of Forensic Medicine, Published by New Central Book Agency.
- Parikh C.K., Parikh's Textbook of Medical Jurisprudence and Toxicology, Publishers, Bangalore.
- Guharaj P. V., Forensic Medicine, Orient Longman Limited
- C. A. Franklin, Modi's Medical, Jurisprudence and Toxicology, Published by M. Tripathi Private Limited, Bombay.
- Parikh C. K. Medico Legal Post Mortem in India, Published by Medical Publication.
- Keith Simpson, Bernard Knight, Forensic Medicine, ELBS.
- Pillay V.V., Text book of Forensic Medicine, Paras Publication.
- Forensic Medicine and Toxicology - Karmakar
- Medical Jurisprudence & Toxicology - Lyon's

JOURNALS FOR REFERENCE

- Medicine Law and Science.
- American Journal of Forensic Medicine and Pathology - Published by Lippincott William & Wilkins.