COURSE, CURRICULUM AND GUIDELINES FOR THE TRAINING PROGRAMME FOR PATHOLOGY FOR MBBS DEGREE, DELHI UNIVERSITY

BROAD GOALS
The subject of Pathology is taught to the Undergraduate Students studying for the MBBS degree in the 3rd to 5th semester (each semester being of six months). At the end of the 5th Semester, the students appear for the 2nd Prof. MBBS Examination held at the University level. It is a bridging discipline involving both basic science and clinical practice and devoted to the study of structural and functional changes in cells, tissues and organs that underlie disease. By the use of molecular, immunologic alongwith cytogenetics, pathology attempts to explain the why and wherefores of the signs and symptoms manifested by patients while providing a sound foundation for rational clinical care and therapy. The following are the broad goals:

- The fundamental and basic principles of Pathogenesis of disease process and the effect that the disease produces on the various organ systems in the body.
- To inculcate in the young minds the logical approach to diagnosis and interpretation of laboratory investigations.
- To introduce newly discovered genes and molecules that have a profound impact on the pathogenesis of disease.
- To facilitates the students to understand the various diseases processes and to correlate morphological diagnostic pathology with immunologic cytogenetics and molecular analysis to assess prognosis and provide a basis for therapy.

LEARNING OBJECTIVE
1. To understand the concept of cell injury, the change produces thereby, in the different tissues and organs and the body capacity for healing.
2. To understand the etiopathogenesis, the pathological effects, and the clínico pathological correlation of common infectious and non-infectious diseases.
3. To understand the concept of neoplasia with respect to etiology, gross and microscopic features, diagnosis and prognosis in different tissues and organs of the body.
4. Correlate normal and altered morphology (gross and microscopy) of different organ systems in different diseases to the extent needed of understanding of the disease processes and their clinical significance.
5. Have an understanding of the common haematological disorders and the investigations necessary to diagnose them and determine their prognosis.
6. To understand normal haemostatic mechanism, the derangements of these mechanism and the effect on human system.
7. Have knowledge of common immunological disorders and their effects on human body.
8. Have a sound knowledge of principles of collection, handling, storage and dispatch of clinical samples from patients, in a proper manner.
9. Perform and interpret in a proper manner some of the basic clinical investigations and correlate them clinically.

COURSE CONTENT
Traditionally the study of pathology is divided into general pathology and special or systemic pathology. The former deals with basic reactions of cells and tissues to abnormal stimuli that underlie all disease while the latter, systemic pathology, examines the specific responses of specialized organs and tissues to more or less well defined stimuli. Overall the course content should address the four aspects of a disease process which form the core of pathology i.e. cause (etiologic) mechanisms of its development (pathogenesis), the structural alterations induced in the cells and organs of the body (morphologic changes) and the functional consequences of the morphologic changes (clinical significance)) and lastly the diagnostic investigations that are required to conclusively prove the presence of disease. The course is therefore divided as general pathology and systemic pathology.

GENERAL PATHOLOGY
1. Cell Injury and Cell Death
   • Causes and mechanism of cell injury Ischemic, toxic, apoptosis, free radical and chemical injury,
   • Reversible and irreversible cell injury, its types and morphological changes including sub cellular response to cell injury.
   • Calcification: Dystrophic and metastatic
• Extracellular accumulation: Amyloidosis, classification, pathogenesis, morphology.

Practicals to include different histopathological slides to demonstrate the various types of cell injury reversible and irreversible cell injury, calcification and extracellular accumulation.

2. Inflammation and tissue repair to include wound healing
   • Acute inflammation: features, causes, vascular and cellular events, chemical mediators of inflammation.
   • Morphologic patterns of acute inflammation
   • Chronic inflammation: causes, types, non specific and granulomatous with common examples.
   • Systemic effect of inflammation.
   • Wound healing by primary and secondary union, factors promoting and delaying the process and complications.

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.

3. Immunopathology
   • General features of the immune system: cells of immune system, cytokines, regulation of immune responses.
   • Mechanism of Immunological tissue injury (hypersensitivity reaction): types and examples, antibodies and cell mediated tissue injury with examples.
   • Autoimmune disorders like systemic Lupus Erythematosus
   • Organ transplantation: Immunological basic of reaction angraft versus host reaction.
   • Immunological deficiency syndrome and acquired immuno deficiency syndrome example: AIDS: etiology, modes of transmission, pathogenesis, pathology, complications, diagnostic procedures and handling of infected materials and health education.

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.
4. Infectious diseases
- Mycobacterial disease: tuberculosis and leprosy
- Bacterial disease: pyogenic, typhoid, diptheria, gram-ve infections, bacillary dysentery, syphilis
- Viral: polio, herpes, rabies, measles, rickettsial, chlamydial infections
- Fungal disease and opportunistic infections
- Parasitic disease: malaria, filaria, amoebiasis, kala azar, cystecercosis, hydatid

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.

5. Circulatory disturbances
- Oedema: pathogenesis and types
- Chronic venous congestion: lung, liver, spleen
- Thrombosis and embolism: formation, fate and effects
- Infarction: Types, common sites, gangrene
- Shock: pathogenesis, types, morphological chances

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.

6. Growth disturbances
- Atrophy, hypertrophy, hyperplasia, hypoplasia, metaplasia, malformation, agenesis, dysplasia
- Neoplasia: causes, classification, histogenesis, biological behaviour benign and malignant, carcinoma and sarcoma
- Malignant neoplasia: grades and stages, local and distant spread
- Carcinogenesis; Environmental carcinogen, chemical, viral, occupational, hereditary and basics of molecular basis of cancer
- Tumour and host interaction: systemic effects including para neoplastic syndrome, tumour immunology,
- Laboratory diagnosis: cytology, biopsy, tumour markers.
- Tumours and tumour like conditions of soft tissues

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.
7. Miscellaneous disorders

- Autosomal and sex-linked disorders with examples
- Protein energy malnutrition and vitamin deficiency disorders
- Radiation injuries
- Disorders of pigments and mineral metabolism such as bilirubin, melanin, haemosiderin

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.

8. Haematopathology

- Anaemia: classification and clinical features
- Nutritional anaemia: iron deficiency, folic acid/ vit B12 deficiency anaemia including pernicious anaemia
- Haemolytic anaemia: classification and investigation
- Hereditary haemolytic anaemia: thalassaemia, sickle cell anaemia, hereditary spherocytosis and G 6 P D deficiency
- Acquired Hemolytic anemias: malaria, kala Azar, autoimmune, alloimmune, drug induced, microagniopathic
- Haemostatic disorders: platelet deficiency, ITP, drug induced, secondary
- Coagulopathies: coagulation factor deficiency, hemophilia, DIC and anticioagulant control
- Leucocytic disorders: leucocytosis, leucopenia, leukemoid reaction
- Acute and chronic leukemia: classification and diagnosis
- Multiple myeloma and dysprotenemias
- Blood transfusion: grouping and cross matching untoward reactions, transmissible infections including HIV and hepatitis
- Myelodysplastic syndrome
- Myelo Proliferative disorders: polycythemia, myelofibrosis

Practicals: P/s & BM slides pertaining to different kind of Anemia, Acute and chronic Leukemia, and demonstration of retic count, sickling, PT, PTTK.
9. Cardiovascular Pathology

- Acute Rheumatic fever: etiopathogenesis and morphological changes and complications including rheumatic heart disease.
- Infective endocarditis: etiopathogenesis and morphological changes and complications.
- Atherosclerosis and ischemic heart disease: myocardial infarction.
- Hypertension and hypertensive heart disease.
- Congenital heart disease: ASD, VSD, Fallot’s teratology, Bicuspid aortic PDA.
- Pericarditis.
- Cardiomyopathy.

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.

10. Respiratory Pathology

- Structure of bronchial tree and alveolar walls, normal and altered inflammatory diseases of bronchi: chronic bronchitis, bronchiectasis.
- Pneumonias: lobar, broncho, interstitial.
- Lung abscess: etiopathogenesis and morphology and complications.
- Pulmonary tuberculosis: primary and secondary, morphologic types including pleuritis.
- Emphysema: type and pathogenesis.
- Nasopharyngeal and laryngeal tumors.
- Occupational lung disorders: anthracosis, silicosis, asbestosis, mesothelioma.
- Atelectasis and hyaline membrane disease.

11. Renal & Urinary tract pathology

- Basic of impaired function and urinalysis.
- Glomerulonephritis: classification, primary Proliferative and on Proliferative, secondary (SLE, polyarteritis, amyloidosis, diabetes).
- Clinical presentation of renal disorders including nephritic, nephritic syndrome, acute renal failure, recurrent hematuria, CRF.
• Acute renal failure: acute tubular and cortical necrosis
• Pyelonephritis, reflux nephropathy, interstitial nephritis
• Renal cell tumors: renal cell carcinoma, nephroblastoma
• Urinary bladder: cystitis, carcinoma
• Progressive renal failure and end stage renal disease
• Renal vascular disorders
• Urinary tract tuberculosis
• Nephrolithiasis and obstructive nephropathy
• Renal malformation polycystic kidney

Practicals to demonstrate the above changes morphologically by suitable histopathological slides.

12. Pathology of Gastrointestinal tract
• Oral pathology: leukoplakia, carcinoma oral cavity and esophagus
• Peptic ulcer: etiopathogenesis and complications, gastritis types
• Tumors of stomach: benign, polyp, leiomyoma, malignant, adenocarcinoma, other gastric tumors.
• Inflammatory disease of small intestine: typhoid, tuberculosis, Crohn’s disease, appendicitis
• Inflammatory disease of large intestine: amoebic colitis, bacillary dysentery, ulcerative colitis
• Large and small intestine tumors: polyps, carcinoid, carcinoma, lymphoma
• Pancreatitis
• Salivary gland tumors
• Ischemic and pseudomembranous enterocolitis, diverticulitis
• Malabsorption-coeliac disease, tropical sprue and other causes
• Pancreatic tumors: endocrine, exocrine and pariampullary

13. Liver and Billiary tract pathology
• Jaundice: type, etiopathogenesis and differentiation
• Hepatitis: acute and chronic, etiology, pathogenesis and pathology
• Cirrhoses; etiology, classification, pathology, complications
• Portal hypertension: types and manifestation
• Diseases of gall bladder: cholecystitis, cholelithiasis, carcinoma
• Tumors of liver: hepatocellular, metastatic, tumor markers

14. Lymphoreticular system
• Lymphadenitis: non-specific, granulomatous, Hodgkin’s lymphoma
• Non-Hodgkin’s lymphoma, classification, morphology
• Diseases of spleen: splenomegaly and effect.

15. Reproductive system
• Diseases of cervix: cervicitis, cervical carcinoma, etiology, cytological diagnosis
• Hormonal influences and histological appearances of different phases of menstrual cycles and the abnormality associated with it.
• Diseases of uterus; endometrial hyperplasia and carcinoma, adenomyosis, smooth muscle tumours
• Trophoblastic diseases: hydatiform mole and choriocarcinoma
• Diseases of breast; mastitis, abscess, fibrocystic disease, neoplastic lesions, fibroadenoma, carcinoma, phyllodes tumors
• Prostate: nodular hyperplasia, carcinoma
• Ovarian and testicular tumours
• Carcinoma of penis
• Pelvic inflammatory disease including salpingitis
• Genital tuberculosis

16. Osteopathology
• Osteomyelitis; acute, chronic, tuberculosis
• Metabolic disease; rickets/osteomalacia, osteoporosis, hyper parathyroidism
• Tumors: primary, osteosarcoma, osteoclasmoma, Ewing’s sarcoma, chondro sarcoma, metastatic.
• Arthritis: rheumatoid, osteoid and tuberculosis
• Healing of fractures
17. Endocrine pathology
- Diabetes mellitus: types, pathogenesis, pathology
- Non neoplastic lesion of thyroid: iodine deficiency goiter, autoimmune thyroiditis, thyrotoxicosis, myxoedema
- Tumors of thyroid: adenoma, carcinoma: papillary, follicular, medullary, anaplastic
- Adrenal disease: cortical hyperplasia, atrophy, tuberculosis, tumors of cortex and medulla
- Parathyroid hyperplasia and tumors

18. Neuropathology
- Inflammatory disorders: pyogenic and tuberculous meningitis, brain abscess, tuberculoma
- CNS tumors-primary glioma and meningioma and metastatic
- CSF and its disturbances: cerebral oedema, raised intracranial pressure
- Cerebrovascular disease: atherosclerosis, thrombosis, embolism, aneurysm, hypoxia, infarction and hemorrhage

19. Dermato-pathology
- Skin tumors: squamous cell, basal cell and melanoma
One third of allotted practical hours to be devoted to

- Identify and interpret gross and microscopic features of acute inflammations in organs such as appendix, lungs, meninges,
- Cellular components of chronic and granulomatous inflammation
- Granulation tissue, callous
- Typhoid, tuberculosis, amoebic ulcers in intestine
- Rhinosporidiosis, actinomycosis, malaria, kala-azar, filarial
- Amoebic liver abscess, malaria liver and spleen, filarial lymphadenitis, cysticercosis
- Fatty liver, amyloidosis of spleen, kidney and liver
- Types of necrosis: caseous, coagulative, liquifactive
- Identify and interpret gross and microscopic features of organs in commonly occurring neoplastic and non-neoplastic diseases

One third of allotted practical hours to be devoted to

- Discussion of case studies (paper) clinical, gross and microscopic features and other parameters wherever applicable to learn clinico pathological correlation inclusive of autopsy studies.

SUGGESTED TOPICS FOR INTEGRATED TEACHING

1. INTEGRATED SEMINARS

- Rheumatic heart disease
- Ischemic heart disease
- Hypertension and Hypertensive disease
- Tuberculosis lung
- Nephrotic syndrome
- Chronic Renal Failure
- Inflammatory disease of small and large bowel
- Cirrhosis
- Metabolic bone disease
- Diabetes mellitus
- HIV/AIDS
- Approach to Diagnosis of Anemia
- Iron deficiency anaemia
- Jaundice
- Malaria, Dengue Chikungunya, Avian Flu
- DIC

**PRACTICAL SKILLS**

- Be able to collect, store and transport materials for various pathological tests including histopathology, cytopathology, clinical pathology, haematology and biochemistry.
- Interpret abnormal laboratory values of common diseases
- Do complete urine examination including microscopy
- Perform and interpret haemoglobin, TLC, DLC, ESR, PCV, bleeding time, clotting time, blood smears and red cell morphology
- Interpret the peripheral smears of common disease’s
- Do blood grouping
- Adopt universal precautions for self protection against HIV and hepatitis.

**SUGGESTED DURATION FOR LECTURES AND PRACTICALS:** Didactic Lectures should form 1/3 of the total teaching hours available for the subject of pathology. 2/3 of the total learning hours should be devoted to practicals, group discussions (tutorials), Clinico-pathological discussions. The lectures schedule should be prepared to incorporate the course content as detailed in general pathology and systemic pathology. Lectures should incorporate modern teaching methodologies and aids.

**PRACTICAL:** of the total Practical hours available the suggested distribution is as follows:

1. One-third of allotted practical hours to be devoted to
   - Performing a complete urine examination and detecting abnormalities and correlating with pathological changes.
   - To performs with accuracy and reliability basic Haematological estimations: TLC, DLC, peripheral smear, staining, reporting along with history.
   - deficiency anaemia (acute + chronic), Hemolytic anaemia, Leukemia

2. One-third for histopathological slides

3. One-third for the group discussion, interactive sessions, tutorials etc.
Teaching learning methods:
- Structured interactive sessions
- Small group discussion
- Practicals including demonstrations
- Problem based exercises
- Autopsy case studies
- Self learning tools
- Interactive learning
- E-modules

LEARNING RESOURCE MATERIALS
- Text books
- Reference books
- Lecture notes
- Internet resources

EVALUATION:
There should be regular formative assessment, during the entire teaching period. The formative assessment should be based on the day to day performance should be given greater importance and form the basis of internal assessment which should be based on regular testing preferably at the end of each system, atleast two term examinations and a preliminary examination should be held before the University examination. The internal assessment should be based on all assessments including term examination and preliminary examination. It is desirable that the distribution of marks should be such that 60% of the internal assessment is calculated from the examination conducted at the end of each system and 40% from the term and (preliminary) University examination.
SUMMATIVE EVALUATIONS (2ND PROFESSIONAL MBBS EXAMINATION)

At the end of 5th Semester the university will hold a university examination. The summative examination would consist of two parts theory and practical. The theory would be examined on two separate papers, each of 3 hours duration. Paper 1 will include questions based on the syllabus from general pathology, hematology and clinical pathology while Paper 2 will include questions based on the syllabus from Systemic Pathology. Practical examination would be conducted for a maximum of 30 students each day and would cover the following exercise Histopathology slides, slide for DLC, a case history with slide, performing the following tests: Hb/TLC/blood grouping, staining of peripheral smear with Leishman/Giemsa, complete urine examination including microscopy, OSPEs.

The distribution of marks is recommended as follows:

DISTRIBUTION OF MARKS FOR SUMMATIVE EVALUATION OF THEORY AND PRACTICLSS:

THEORY:

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<tr>
<td><strong>Total Marks</strong>:</td>
<td>150</td>
<td>300</td>
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<td>Theory (Max Marks: 110)</td>
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<td>Theory (Max Marks: 200)</td>
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<tr>
<td><strong>Paper 1</strong>: General pathology + Hematology + Clinical Pathology</td>
<td>(Max marks: 40) (Time: 3hrs)</td>
<td><strong>Paper 1</strong>: General pathology + Hematology + Clinical Pathology</td>
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<tr>
<td><strong>Paper 2</strong>: Systemic Pathology</td>
<td>(Max Marks: 40) (Time: 3hrs)</td>
<td><strong>Paper 2</strong>: Systemic Pathology</td>
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<td>Internal Assessment (Max. Marks) : 15</td>
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<td>Internal Assessment (Max. Marks) : 40</td>
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<td>VIVA (Max marks) : 15</td>
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<td>VIVA (Max marks) : 30</td>
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**PRACTICAL:**

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<td>Practical (Max marks: 40)</td>
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<td>Practical Examination (Max. Marks): 25</td>
<td>Practical Examination (Max. Marks): 80</td>
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<tr>
<td>Internal assessment (Max. Marks): 15</td>
<td>Internal assessment (Max. Marks): 20</td>
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The distribution of Practical examination is as follows:

<table>
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<tr>
<th>EXERCISE</th>
<th>EXISTING MARKS (25)</th>
<th>PROPOSED MARKS (80)</th>
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<tr>
<td>Histopathology slides without history (3)</td>
<td>$3 \times 2 = 6$</td>
<td>$3 \times 5 = 15$</td>
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<tr>
<td>1 slide without history for DLC</td>
<td>1</td>
<td>5</td>
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<tr>
<td>1 slide with history for interpretation of smear provided eg IDA, CML, ALL etc.</td>
<td>2</td>
<td>5</td>
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<tr>
<td>Perform Hb/TLC</td>
<td>1+1</td>
<td>5</td>
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<tr>
<td>To make smear and stain it with Leishman/Giemsa</td>
<td>1+1</td>
<td>5</td>
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<tr>
<td>Blood grouping</td>
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<td>5</td>
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<tr>
<td>Complete urine examination including M/E</td>
<td>4</td>
<td>10</td>
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<tr>
<td>OSPE-to include specimens (at least 3 specimens), instruments, clinical case histories with photographs (at least 4), identification of marrow cells, typical fungal lesions, common parasites</td>
<td>$8 \times 1 = 8$</td>
<td>$15 \times 2 = 30$</td>
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GOAL: To inculcate a rational and scientific basis of therapeutics in a medical graduate

OBJECTIVES:

(a) Knowledge and intellectual skills
At the end of the course, the learner shall be able to:

1. Understand the general principles of drug action and handling of drugs by the body in all the individuals including children, elderly, lactating and pregnant women and those having a renal and/or hepatic disease and genetic variations.

2. Prescribe drugs rationally by:
   a. Understanding the importance of both the non-drug and drug treatment
   b. Selection of drugs based on suitability, tolerability, efficacy and cost.

3. Apply pharmacokinetic principles in clinical practice pertaining to the drugs used in commonly encountered conditions, National Health Programmes and emergency medical conditions.

4. Foresee, prevent and manage adverse drug events and drug interactions.

5. Use antimicrobials judiciously for therapy and prophylaxis.

6. Understand and implement the concepts of essential medicines, pharmacoconomics and evidence-based medicine for improving the community health care.

7. Describe the clinical presentation and management of common poisoning including bites and stings.

8. Understand the basic concepts of new drug development with emphasis on design and conduct of clinical trials and interpretation of their results.

(b) Psychomotor skills
At the end of the course, the learner shall be able to:

1. Write a correct, complete and legible prescription for common ailments including those in the National health Programmes and emergency medical conditions.

2. Calculate the drug dosage using appropriate formulae for an individual patient.

3. Administer the required dose of different drug formulations using appropriate devices and techniques (e.g. injections, inhalers, transdermal patches etc.).

4. Advice and interpret the therapeutic monitoring reports of important drugs.

5. Identify, analyze and report adverse drug reactions to appropriate authorities.

6. Retrieve drug information from appropriate sources including the electronic resources.

7. Analyse critically drug promotional literature in terms of pharmacological actions of the ingredients, rational/irrational nature of the preparation, economics of the use and claims by the pharmaceutical companies.
8. Interpret data from in-vitro and in-vivo experiments designed to study the effect of drugs in animals and human beings.

(c) **Attitude and communication skills**

At the end of the course, the learner shall be able to:

1. Communicate with the patient regarding optimal use of drug therapy, devices and storage of medicines.

2. Follow the drug treatment guidelines laid down for common diseases including those covered under the national Health Programmes and emergency medical conditions and be capable of initiating and monitoring the treatment, recording progress and assessing the outcome.

3. Motivate patients with chronic diseases to adhere to the line of management as outlined by the health care provider.

4. Appreciate the relationship between cost of treatment and patient compliance.

5. Exercise caution in prescribing drugs likely to produce dependence and recommend the line of management.

6. Understand the legal and ethical aspects of prescribing drugs.

7. Evaluate the ethics, scientific procedures, social and legal implications involved in the development and introduction of new drugs.

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# COURSE CONTENTS IN PHARMACOLOGY, DELHI UNIVERSITY

## (a) Knowledge

### (I) Concepts of General and Clinical Pharmacology

1. Introduction: definition, historical perspective, branches and scope of the subject of pharmacology and its relation with other medical disciplines
2. Nature and sources of Drugs, Drug nomenclature and dosage forms
3. Routes of drugs' administration; advantages and disadvantages of different routes
4-6. Pharmacokinetic considerations: drug absorption, distribution, biotransformations and excretion
7. Pharmacokinetic concepts of bioavailability, apparent volume of distribution (aVd), half life (t½), and clearance (CL) that are used to decide the doses and rational dosing during the drug treatment.
8-9. Pharmacodynamics; site and mechanism of drug action, drug receptors and receptor regulation, concepts of agonists, antagonists, partial agonist and inverse agonist drugs
10. Quantitative aspect of drug action: analysis of dose response curve and therapeutic index (safety index)
11. Factors affecting drug action and doses, how to prolong or shorten the drug action and effects
12. Drug interactions and concept of pharmacogenomics/-genetics in drug action, effects and ADRs
13. Adverse drug reactions (ADRs) and role of pharmacovigilance activity in ADR monitoring
14. Concept of evidence-based medicine, essential medicines, pharmacoeconomics, P-drugs and rational prescribing
15. Development of new drugs: pre-clinical and clinical phases of drug evaluation
16. Scope and relevance of Clinical Pharmacology
17. Essential medicine, rationality of fixed dose combinations
18. Drug regulation acts and other legal aspects

## (b) Systemic Pharmacology – Drug oriented teaching,

(Here a core information about drugs is to be given that should include pharmacological actions, mechanism of action, indications, contraindications, side effects, drug interactions, precautions etc.)

### (II) Drugs Affecting Autonomic Nervous System (ANS)

19. Introduction to Pharmacology of ANS
20-21. Cholinergic drugs: cholinoreceptor agonist and cholinesterase inhibiting drugs
22. Anticholinergic drugs: cholinoreceptor blocking agents
25-26. Anti-adrenergic drugs: adrenoceptor antagonists (α & β receptor blockers) and sympatholytic agents
(III) Drugs Affecting Peripheral Nervous System (PNS)
27 Local anaesthetics
28 Skeletal muscle relaxants

(IV) Drugs Affecting Cardiovascular System (CVS)
29 Drugs affecting vascular tone and volume of circulation, renin angiotensin system and other mechanisms affecting this system
30-31 Antihypertensive drugs
32 Anti-anginal drugs, management of Myocardial Infarction
33-34 Drugs for heart failure
35 Anti-arrythmic agents
36 Anti-dyslipidemic agents, drugs used in peripheral vascular disease*
37 Nitric oxide donors and inhibitors and basic concepts of treatment of shock*

(V) Drugs Affecting Autacoids, Inflammation and Gout
38 Histamine, serotonin & their antagonists, treatment of migraine
39 PGs, LTs
40 PAF*
41 NSAIDs
42 Drug treatment of gout, rheumatoid arthritis & other autoimmune diseases

(VI) Drugs Affecting Kidney Function
43-44 Diuretics
45 Antidiuretics*

(VII) Drugs Affecting Respiratory System
46 Antitussives, expectorants, mucolytics*
47 Drug treatment of bronchial asthma, COPD

(VIII) Drugs Affecting Gastro-intestinal System
48-49 Drugs for gastric acidity, peptic ulcer & GERD
50 Antiemetic and prokinetic agents
51 Drugs for constipation and Inflammatory Bowel Disease
52 Antidiarrhoeal agents

(IX) Drugs Acting on Blood
53-54 Agents used to treat anemias and haematopoietic growth factors
55 Coagulants and anticoagulants
56 Antiplatelet drugs
57 Fibrinolytic, antifibrinolytic, plasma expanders
(X) Drugs Affecting Central Nervous system

58 Introduction and basic concepts of drugs affecting CNS activity: Neurotransmitters and their pathways and important sites of Central Nervous System effect of drugs
59 Sedative hypnotic drugs
60 General anaesthetics with preanaesthetic medications
61-62 Antiepileptic drugs
63 Antipsychotic drugs
64 Antianxiety drugs
65 Antidepressant and antimaniac drugs
66 Opioid analgesic and antagonists
67 Antiparkinsonian drugs and drugs for other neurodegenerative and movement disorders
68 Pharmacology of ethyl alcohol and other alcohols
69-70 Pharmacology of CNS stimulants, psychomimetic drugs, drug dependence and substance abuse

(XI) Drugs Affecting Endocrine System and its Diseases

71 Pharmacology of pituitary and hypothalamic hormones
72 Thyroid hormones and antithyroid drugs
73 Estrogen, progesterone and inhibitors
74 Oral contraceptives & HRT
75 Androgen
76-77 Drugs for diabetes mellitus: Insulin and oral antidiabetic agents
78-79 Adrenocorticosteroids
80 Parathyroid hormones and drugs affecting calcium balance
81 Drugs acting on uterus
82 Drug treatment for infertility and erectile dysfunctions

(XII) Pharmacology of Chemotherapeutic Agents

83-84 Introduction and basic principles of chemotherapy of infection, infestation and neoplastic diseases and concepts of resistance to chemotherapeutic agents
85 Sulfonamides
86 Quinolones
87-88 β-Lactam antibiotics
89 Aminoglycosides
90 Macrolides and ketolides
91 Tetracycline and chloramphenicol
92 Oxazolidinones, streptogramin and other antibiotics
93  Antimycobacterial drugs, antitubercular drugs; treatment of MDR and XDR tuberculosis
94  Antileprosy drugs
95  Antifungal drugs
96  Antimalarial drugs
97  Antiamoebic and other antiprotozoal drugs
98  Drugs used in filariasis and kalaazar
99  Anthelmintic agents
100-101 Antiviral, anti-AIDS drugs
102  Chemotherapy of Urinary tract infection & STDs
103  Basic principles of cancer chemotherapy*

(XIII) Immunopharmacology
104  Vaccines, immunomodulators and treatment of transplant rejection disorders

(XIV) Miscellaneous Topics
105  Vitamins, nutraceuticals and probiotics
106  Drugs acting on skin and mucous membrane
107  Pharmacology of Diagnostic agents
108  Paediatric pharmacology
109  Geriatric pharmacology
110  Pharmacology of chelating agents

* Desirable to know
EVALUATION

Theory (150 marks)  (Paper I – 75, Paper II – 75), Internal assessment - 20
Practical (80 marks)  (Pharmacy – 10, Experimental – 10, Clinical Pharmacology – 30, OSPE (30), Internal assessment - 20
Viva-voce (30)

Pharmacy
1. Dosage forms, formulations, Sources of drug
2. Practical ORS, Benzyl benzoate emulsion, Mandl’s throat paint, Whitfield ointment, Liniment turpentine, Lacto Calamine Lotion
3. Use of inhalers, nebulizers
4. Prescription writing

Experimental
1. Rabbit's eye
2. Guinea-pig ileum
3. CNS demonstrations
   a. Analgesic activity – Hot plate / tail-flick / writhing
   b. Sleeping time
   c. PTZ / Electroconvulsions
   d. Rotarod – diazepam
   e. Openfield locomotor activity

Clinical Pharmacology
1. Drug dose calculation
2. Drug advertisement
3. Rational use of drugs, drug prescribing for specific conditions
4. Clinical trial: use of caffeine on normal healthy volunteers
5. Therapeutic problems
6. P-drug
7. ADR monitoring

Communication Skills
Learning Objectives

At the end of the course in Forensic Medicine, the learner shall be able to:

1. Identify, examine and prepare report or certificate in medico-legal cases/situations in accordance with the law of land.
2. Perform medico-legal postmortem examination and interpret autopsy findings and results of other relevant investigations to logically conclude the cause, manner and time since death.
3. Be conversant with medical ethics, etiquette, duties, rights, medical negligence and legal responsibilities of the physicians towards patients, profession, society, state and humanity at large.
4. Be aware of relevant legal / court procedures applicable to the medico-legal/medical practice.
5. Preserve and dispatch specimens in medico-legal / postmortem cases and other concerned materials to the appropriate Government agencies for necessary examination.
6. Manage medico-legal implications, diagnosis and principles of therapy of common poisons.
7. Be aware of general principles of environmental, occupational and preventive aspects of toxicology.

Course contents

<table>
<thead>
<tr>
<th>Forensic Medicine (Forensic Pathology)</th>
<th>Must know</th>
<th>Desirable to know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Definition of Forensic Medicine and Medical Jurisprudence.</td>
<td>√</td>
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</tr>
<tr>
<td>2. Courts in India and their powers: Supreme Court, High Court, Sessions Court, Additional Sessions Court, Magistrate’s Courts.</td>
<td>√</td>
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<tr>
<td>3. Court procedures: Summons, conduct money, oath, affirmation, perjury, types of witnesses, recording of evidence, conduct of doctor in witness box,</td>
<td>√</td>
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<tr>
<td>4. Medical certification and medico-legal reports including dying declaration.</td>
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<tr>
<td>5. Death :</td>
<td></td>
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</tr>
<tr>
<td>a) Definition, types; somatic, cellular and brain – death.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>b) Sudden natural and unnatural deaths.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>c) Suspended animation.</td>
<td>√</td>
<td></td>
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<tr>
<td>6. Changes after death :</td>
<td></td>
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</tr>
<tr>
<td>a) Immediate changes, cooling of body, lividity, rigor mortis, cadaveric spasm, cold stiffening and heat stiffening.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>b) Putrefaction, mummification, adipocere and maceration.</td>
<td>√</td>
<td></td>
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<tr>
<td>c) Estimation of time of death.</td>
<td>√</td>
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<tr>
<td>d) Postmortem artifacts.</td>
<td>√</td>
<td></td>
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<tr>
<td>7. Inquest: Inquest by police, magistrate.</td>
<td>√</td>
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<tr>
<td>8. Identification:</td>
<td>Must know</td>
<td>Desirable to know</td>
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<td>-------------------------</td>
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</tr>
<tr>
<td>a) Definition,</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>b) Identification of unknown person, dead bodies and remains of a person by age, sex, stature, dental examination, scars, moles, tattoos, dactylography, DNA typing and personal belonging including photographs.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>10. Medico-legal autopsies:</td>
<td></td>
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<tr>
<td>a) Definitions of medico-legal and clinical/pathological autopsies.</td>
<td>√</td>
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<tr>
<td>b) Objectives, procedures, formalities of medico-legal autopsies.</td>
<td>√</td>
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<tr>
<td>c) Preservation of articles of importance, during autopsy.</td>
<td>√</td>
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<tr>
<td>d) Preservation of body fluids &amp; viscera in suspected poisoning.</td>
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<tr>
<td>11. Mechanical injuries or wounds:</td>
<td></td>
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</tr>
<tr>
<td>a) Definition, classification of mechanical injuries; description of blunt force, sharp force and firearm injuries.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>b) Medico-legal aspects of injuries, differences between ante-mortem and post-mortem injuries, estimation of age of different types of injuries, defence injuries, hesitation cuts; fabricated injuries; simple and grievous hurt, suicidal/accidental/homicidal injuries; causes of death by mechanical injuries.</td>
<td>√</td>
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<tr>
<td>13. Injuries due to physical agents, and their medico-legal importance; cold, heat, electricity and lightning and explosions.</td>
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<tr>
<td>15. Deaths due to starvation.</td>
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<tr>
<td>19. Biological fluids:</td>
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<tr>
<td>a) Blood – Preservation, dispatch of samples, importance of blood group in disputed paternity.</td>
<td>√</td>
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<tr>
<td>Topic</td>
<td>Must know</td>
<td>Desirable to know</td>
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<tr>
<td><strong>FORENSIC PSYCHIATRY</strong></td>
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<tr>
<td>b) Seminal stains – Preservation and dispatch of samples.</td>
<td>√</td>
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</tr>
<tr>
<td>1. Definition and brief overview of common mental illnesses.</td>
<td>√</td>
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</tr>
<tr>
<td>2. True and feigned mental illness.</td>
<td>√</td>
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<tr>
<td>3. Civil and criminal responsibilities of a mentally ill person.</td>
<td>√</td>
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</tr>
<tr>
<td><strong>MEDICAL JURISPRUDENCE</strong></td>
<td></td>
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</tr>
<tr>
<td>1. Indian Medical Council and State Medical Councils; their functions and disciplinary control.</td>
<td>√</td>
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</tr>
<tr>
<td>2. Rights and privileges and duties of a registered medical practitioner, Disciplinary proceedings and penal erasure.</td>
<td>√</td>
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<tr>
<td>3. Professional conduct, Etiquette and Ethics in medical practice.</td>
<td>√</td>
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<tr>
<td>4. Professional secrecy, privileged communication.</td>
<td>√</td>
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<tr>
<td>5. Medical Negligence: civil and criminal negligence, contributory negligence, vicarious liability, res ipsa loquitor, prevention of medical negligence and defences in medical negligence suits.</td>
<td>√</td>
<td></td>
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<tr>
<td>6. Consent: Types, informed consent, age in relation to consent, consent in relation to mental illness and alcohol intoxication, emergency and consent.</td>
<td>√</td>
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<tr>
<td>7. The Pre-natal Diagnostic Techniques Act (Prohibition of sex selection).</td>
<td>√</td>
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<tr>
<td>10. Certification of births, deaths, illness and fitness.</td>
<td>√</td>
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<tr>
<td>11. Euthanasia</td>
<td></td>
<td>√</td>
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<tr>
<td><strong>TOXICOLOGY</strong></td>
<td></td>
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</tr>
<tr>
<td>Duties of doctor in cases of poisoning, medico-legal autopsy in poisoning, preservation and dispatch of viscera for chemical analysis. Role of Forensic Science Laboratory in brief.</td>
<td></td>
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</tr>
<tr>
<td>2. Types of poisons, diagnosis, principles of therapy and medico-legal aspects of:</td>
<td></td>
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</tr>
<tr>
<td>a) Corrosive poisons: strong mineral acids and organic acids.</td>
<td>√</td>
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<tr>
<td>b) Metallic poisons: Lead, Arsenic, Mercury and Copper.</td>
<td>√</td>
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<tr>
<td>c) Animal poisons: Snake and insect bites.</td>
<td>√</td>
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<tr>
<td>d) Deliriants: Dhatura, Cannabis and Cocaine.</td>
<td>√</td>
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<tr>
<td>e) Somniferous agents: Opium, Morphine and other opioids</td>
<td>√</td>
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<tr>
<td>Must know</td>
<td>Desirable to know</td>
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<tr>
<td>f) Inebriants: Methyl and ethyl alcohol.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>g) Asphyxiant poisons: Carbon monoxide, Carbon dioxide, Methane and cyanides.</td>
<td>✓</td>
<td></td>
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<tr>
<td>h) Cardiac poisons: Cerbera thevetia and Nerium odorum.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>i) Miscellaneous: Aspirin, paracetamol, barbiturates, diazepam, antihistaminics, antidepressants and kerosene oil.</td>
<td>✓</td>
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</tr>
<tr>
<td>j) Insecticides: Organophosphorus compounds, Carbamates and Organochloro compounds, Aluminium phosphide.</td>
<td>✓</td>
<td></td>
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<tr>
<td>k) Food poisoning.</td>
<td>✓</td>
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<tr>
<td>l) Drug abuse and dependence.</td>
<td>✓</td>
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</tbody>
</table>

**Desirable to know following poisonings:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a) Inorganic non metallic poisons: Phosphorous.</td>
<td>✓</td>
</tr>
<tr>
<td>b) Organic vegetable irritants.</td>
<td>✓</td>
</tr>
<tr>
<td>c) Cardiac Poisons: Aconite,</td>
<td>✓</td>
</tr>
<tr>
<td>d) Convulsants: Strychnine.</td>
<td>✓</td>
</tr>
<tr>
<td>e) Paralytic agents, Curare.</td>
<td>✓</td>
</tr>
<tr>
<td>f) Mechanical poisons.</td>
<td>✓</td>
</tr>
</tbody>
</table>

**SKILLS**

<table>
<thead>
<tr>
<th>Skill</th>
<th>Able to perform independently</th>
<th>Able to perform under guidance</th>
<th>Assist</th>
<th>Observe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prepare proper certificates of birth and death.</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>2. Prepare dying declaration.</td>
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<td>✓</td>
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<tr>
<td>3. Give evidence in a court of law as an expert witness.</td>
<td></td>
<td>✓</td>
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<tr>
<td>4. Collect and do proper labeling, preservation and dispatch of medico-legal specimens.</td>
<td></td>
<td>✓</td>
<td></td>
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<tr>
<td>5. Diagnose and manage common acute and chronic poisonings.</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Perform the medico-legal duties in case of poisoning.</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill</td>
<td>Able to perform independently</td>
<td>Able perform under guidance</td>
<td>Assist</td>
<td>Observe</td>
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<tr>
<td>7. Observing of ten medico-legal autopsies and enter the reports in practical record.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>8. Age estimation from bones, x-rays and dentition (mock exercise).</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>9. Examination of injuries, weapons and report writing (mock exercise).</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>10. Examination of an alcohol intoxicated person and report writing (mock exercise).</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>11. Examination of victim and accused in sexual offences and report writing. (mock exercise).</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>12. Study of specimens of poisons.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>13. Study of wet specimens.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

METHOD OF ASSESSMENT:
Modified essay question, Microscopic examination, Short answer questions, Problem solving exercises, Records Review and Oral Viva Voce

TEACHING LEARNING METHODS:
Small group discussion, Practical including demonstrations and Problem based exercises.

TIME OF EVALUATION:
There should be regular formative assessment. Formative assessment, day-to-day performance should be given greater importance. Examination of Forensic Medicine & Toxicology should be at the end of 5th semester and formative assessment in the middle of 3rd, 4th and 5th semester and summative assessment at the end of 5th semester.
LEARNING RESOURCE MATERIALS

Text books, Reference books.

Suggested Textbooks for Forensic Medicine & Toxicology
5. Text Book of Forensic Medicine & Toxicology - by Dr. P.C. Dikshit Pee Pee Publishers.

Reference Books:

JOURNALS:
1. Journal of Indian Academy of Forensic Medicine.
2. Indian internet Journal of Forensic Medicine and Toxicology
UNDERGRADUATE TEACHING IN MICROBIOLOGY

PROGRAMME OBJECTIVES
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 and control of infections in the community.

SPECIFIC LEARNING OBJECTIVES
a) Cognitive domain
At the end of the course the student shall be able to:

1. State the infective microorganisms of the human body and describe the host parasite relationship.
2. List pathogenic microorganisms (bacteria, virus, parasites, fungi) and describe the pathogenesis of the diseases produced by them.
3. State or indicate the modes of transmission of pathogenic and opportunistic organisms and their sources, including insect vectors responsible for the transmission of the infection.
4. Describe the mechanisms of immunity to infections.
5. Acquire knowledge on suitable antimicrobial agents for treatment of infections and scope of immunotherapy and different vaccines available for prevention of communicable diseases.
6. Plan laboratory investigations for the diagnosis of infectious diseases and to correlate the clinical manifestations with the etiological agent.
7. Awareness of principles of biomedical waste management in the hospital as well as at primary care level.
8. Acquire knowledge of the emerging and reemerging infectious agents.

b) Psychomotor domain
At the end of the course the student shall be able to:

1. Use the correct method of collection, storage and transport of clinical material for microbiological investigations.
2. Identify the common infectious agents with the help of laboratory procedures and use antimicrobial sensitivity tests to select suitable antimicrobial agents.
3. Perform commonly employed bedside tests for the detection of infectious agents such as blood film for malaria, filaria, gram staining, albert staining and acid fast staining. Stool sample for ova and cyst.
4. Apply methods of sterilization and disinfections to control and prevent hospital and community infections.
5. Apply methods of infection control, hand hygiene standard precautions in their hospital practice to control and prevent hospital and community infections.

c) Affective domain:
The student shall understand infectious diseases of national importance in relation to the clinical, therapeutic and preventive aspect.

1. Interpret laboratory investigations for the diagnosis of infectious diseases and to correlate the clinical manifestations with the etiological agent.
2. Recommend laboratory investigations regarding bacteriological examination of food, water, milk and air
3. more emphasis on analytical interpretation of integrated topics which are important from public health view.
   - Tuberculosis, Sexually transmitted diseases, HIV, Hepatitis, Malaria, Dengue, Influenza etc.)
4. Involvement of other specialities like pathology, radio diagnosis, medicine, surgery, pediatrics etc. to teach such diseases in integrated manner.
5. Also, interpretation of syndromic approach for diagnosis of infectious diseases needs to be emphasized. This will help to understand the diagnosis and management on clinical level.

**COURSE CONTENT**

1. **KNOWLEDGE**

   Course content is as per MCI syllabus in Microbiology for MBBS undergraduate students

**ADD to detailed MCI syllabus:**

1. Point no. 2: Add hand hygiene, Principles of infection control, isolation precautions; general and disease specific.
2. Point no. 8: Add
   a) Infection control  
   b) Biomedical waste management  
   c) Disaster management with respect to infectious diseases.  
   d) Application of molecular techniques in clinical microbiology  
   e) nosocomial infections

3. Point no. 9: Add
   a) Integrated approach to various diseases of national importance  
   b) Emerging and reemerging infections.  
   c) Sample collection and transportation with hands on training.

2 **SKILLS**

a. Identify common infectious etiological agents with the help of lab procedures  
b. Interpretation of various lab tests done for the diagnosis of infectious diseases  
c. Correlate clinical signs and symptoms with the infectious agent  
d. Practical training with emphasis on following aspects:
   1. Grams staining  
   2. Alberts staining  
   3. Z N staining for acid fast bacilli  
   4. Test for motility of bacteria  
   5. Culture media  
   6. Anaerobic techniques  
   7. Identification of bacterial cultures on culture media  
   8. Identification of biochemical tests
9. Antibiotic sensitivity techniques
10. Identification of parasitic ova and cysts in stool sample
11. Common laboratory techniques for virus identification
12. Fungal LPCB mount
13. Instruments/techniques
14. Interpretation and application of serological tests
15. Slide Identification

**EVALUATION**

1. **INTERNAL ASSESSMENT (FORMATIVE)**
   - Internal assessment for both theory and practical remain on 15 marks each as before.
   - Practical internal assessment includes marks for practical record books

2. **UNIVERSITY ASSESSMENT (SUMMATIVE)**
   - Theory
     - Paper 1: 60 marks
     - Paper 2: 60 marks
     - Internal assessment 15 marks
     - Grand Viva 15 marks
     - Grand Total: 150

   - Practical
     - Spots (9 marks)
     1. Slide (1)
     2. Biochemical (1)
     3. Media/test (1)
     4. Instrument/technique (1)
     5. fungal LPCB (1)
     6. clinical smear(2)
     7. peripheral smear(2)

     Albert staining 5 marks
     Z N staining 5 marks
     Stool exercise 6 marks
     Culture exercise 10 marks
     Total 35 marks

     Internal assessment 15 marks (includes 5 marks for file)

     Grand total 50 marks

     Total (theory plus practical 200 marks)