

2.1 PATHOPHYSIOLOGY (THEORY 90 HOURS)

Teaching Scheme

Lectures: 03 Hr/Week

Examination Scheme

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100 Marks

Scope: This subject provides students with a clear understanding of the basic pathophysiological mechanisms of various diseases and their relevance to pharmacology. It builds a strong foundation for learning pathology and applying this knowledge in other pharmacy subjects.

Course Objectives

- To explain the basic mechanisms of cell injury, inflammation, immunity, cancer, shock, radiation injury, environmental and nutritional disorders.
- To describe the etiology, pathophysiology, clinical features, and complications of common diseases.
- To discuss the pathophysiology and transmission of major infectious diseases.
- To correlate disease mechanisms with clinical features to support the study of pharmacology and pharmacotherapeutics.

Course Outcomes: Upon successful completion of this course, the student shall be able to

- CO 1.** Explain the causes, mechanisms, morphological changes and cellular adaptations involved in cell injury and metabolic disorders.
- CO 2.** Describe the mechanisms of acute and chronic inflammation, chemical mediators, wound healing and factors influencing tissue repair.
- CO 3.** Explain the concepts of immunity, hypersensitivity, autoimmunity, transplantation, AIDS and amyloidosis.
- CO 4.** Describe the etiology, pathogenesis, classification, diagnosis, invasion and metastasis of benign and malignant tumors.
- CO 5.** Discuss the types, mechanisms, stages, management of shock and the biological effects of radiation on the human body.
- CO 6.** Explain the pathophysiology of environmental pollutants, smoking, nutritional disorders, obesity, vitamin deficiencies and starvation.
- CO 7.** Describe the pathophysiology, clinical manifestations and complications of common neurological, cardiovascular, endocrine, gastrointestinal, hepatic, renal and respiratory diseases.
- CO 8.** Explain the etiology, pathophysiology, transmission, clinical manifestations and complications of common infectious diseases.

COURSE CONTENTS

Unit	Topics	Duration (Hrs)
I	Basic Principles of Cell Injury and Adaptation a) Causes, pathogenesis and morphology of cell injury b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen storage diseases	10
II	Inflammation a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation b) Repairs of wounds in the skin, factors influencing healing of wounds	10
III	Diseases of Immune System a) Introduction to T and B cells b) MHC proteins or transplantation antigens c) Immune tolerance - Hypersensitivity Hypersensitivity type I, II, III, IV, biological significance, Allergy due to food, chemicals and drugs - Autoimmunity Criteria for autoimmunity, classifications of autoimmune diseases in man, mechanism of autoimmunity, transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft - Acquired immune deficiency syndrome (AIDS) - Amyloidosis	13
IV	Cancer Differences between benign and malignant tumors, histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer. Significance of key cancer biomarkers: HER2, EGFR, BRCA1/BRCA2, ctDNA and PSA.	12
V	Shock - Types of shock, mechanisms, stages and management Biological Effects of Radiation a) Introduction and classification of radiation b) Mechanism of radiation injury at cellular level c) Subcellular and cellular pathological changes d) Determinants of radiation damage e) Chronic effects of radiation	10

VI	Environmental and Nutritional Disorders a) Air pollution and smoking - SO ₂ , NO, NO ₂ and CO b) Role of oxidative stress in the development of diseases. c) Protein calories and malnutrition d) Vitamins e) Obesity f) Pathology of starvation	11
VII	Pathophysiology of Common Diseases a) Stroke (Ischemic and hemorrhage) b) Angina (Chronic coronary syndrome), CCF, Atherosclerosis, Myocardial infarction c) Hypertension d) Diabetes Mellitus e) Peptic ulcer and inflammatory bowel diseases f) Cirrhosis and alcoholic liver diseases g) Acute and chronic renal failure h) Asthma and chronic obstructive airway diseases i) Parkinsonism j) Schizophrenia k) Depression and mania	13
VIII	Infectious Diseases a) Sexually transmitted diseases (HIV, Syphilis, Gonorrhea) b) Urinary tract infections c) Pneumonia d) Typhoid e) Tuberculosis f) Leprosy g) Malaria h) Dysentery (bacterial and amoebic) i) Hepatitis - infective hepatitis j) Fundamentals of antimicrobial resistance	11

Assignments

Title of the Experiment

1. Chemical Mediators of inflammation
2. Drug Hypersensitivity
3. Cigarette smoking and its impact on health
4. Biological Effects of Radiation
5. Causes of obesity and its implications
6. Complications of diabetes
7. Diagnosis of cancer
8. Vitamin deficiency disorders
9. Methods in Pathology-Laboratory values and their clinical interpretations
10. Pathophysiology of Dengue Hemorrhagic Fever (DHF)

Format of the assignment

1. Minimum and Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy.
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

Text Books (Latest Edition)

1. Kumar, Abbas and Aster. Robbins and Cotran Pathologic Basis of Disease.
2. Harsh Mohan. Textbook of Pathology. Jaypee Brothers Medical Publishers.
3. L. Maximilian Buja and Gerhard J. Krueger. Netter's Essential Pathology.
4. Vinay Kumar, Abul K. Abbas and Jon C. Aster. Robbins Basic Pathology.

Reference Books (Latest Edition)

1. Kathryn L. McCance and Sue E. Huether. Pathophysiology: The Biologic Basis for Disease in Adults and Children.
2. Roger Walker, Cate Whittlesea, Karen Clancy and colleagues. Clinical Pharmacy and Therapeutics.

2. 2: PHARMACEUTICAL MICROBIOLOGY (THEORY 90 HOURS)

Teaching Scheme

Lectures: 03 Hr / Week

Examination Scheme:

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100 Marks

Scope: Pharmaceutical Microbiology provides essential knowledge of microorganisms and their role in pharmaceutical and clinical practice, including identification, control, sterility testing, antimicrobial therapy, vaccines, diagnostics and quality assurance.

Course Objectives

- To understand microbial classification, cultivation, identification, and microbial control relevant to pharmaceutical sciences.
- To develop an understanding of immunology, antimicrobial susceptibility testing, microbiological assays and vaccine standardization.
- To provide knowledge of infectious diseases and conventional and molecular diagnostic techniques.
- To enable the application of microbiological principles in pharmaceutical quality assurance, sterility testing and infection control.

Course Outcomes: Upon successful completion of the course, the student shall be able to

- CO 1.** Explain the classification, morphology, cultivation, nutrition, and growth characteristics of microorganisms relevant to pharmaceutical sciences.
- CO 2.** Identify microorganisms using staining techniques, biochemical tests and microbial enumeration methods.
- CO 3.** Apply principles of sterilization, sterility assurance, validation, and sterility testing in pharmaceutical microbiology.
- CO 4.** Evaluate the mechanisms and applications of disinfectants, antiseptics, preservatives and other microbial control agents.
- CO 5.** Explain the principles of immunity, antigen–antibody reactions, immunization and vaccine standardization.
- CO 6.** Interpret antimicrobial susceptibility testing, microbiological assays, and the standardization of antibiotics, vitamins, vaccines and sera.
- CO 7.** Describe the etiology, diagnosis, prevention, and control of major infectious diseases of pharmaceutical and clinical importance.
- CO 8.** Interpret the principles and applications of conventional, immunological and molecular diagnostic techniques used in the diagnosis of infectious diseases.

Course Content

Unit	Topics	Duration (Hrs)
I	Fundamentals of Microbiology: a) Introduction to the science of microbiology and pharmaceutical microbiology. Major divisions of microbial world and relationship among them. b) General methods of microbial classification. c) Study of bacteria, fungi, viruses, rickettsiae and spirochetes.	10
II	Microbial Nutrition, Culture Media and Growth: a) Nutritional requirements, physico-chemical factors influencing bacterial growth, growth curve; cultivation of bacteria (aerobes and anaerobes) and viruses. b) Study of different important culture media required for the growth of aerobic and anaerobic bacteria & fungi: differential media, enriched media, enrichment media and selective media. Maintenance of laboratory cultures.	10
III	Isolation, Characterization and Counting of Bacteria: a) Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. b) Counting of bacteria - total and viable counting techniques.	10
IV	Physical Methods of Microbial Control, Validation and Sterility testing: a) Detailed study of different physical methods of sterilization, application to pharmaceuticals, their merits and demerits b) Sterility assurance and validation of sterilization methods. c) Detailed study of sterility testing of different pharmaceutical products.	11
V	Chemical Methods of Microbial Control: a) Disinfectants - classification, mechanism of action and factors affecting disinfectant action, study of disinfectants, antiseptics, fungicidal and virucidal agents. b) Evaluation of bactericidal, bacteriostatic and virucidal activities. c) Evaluation of preservatives in pharmaceutical preparations.	11
VI	Immunology and Immunization: a) Immunity - definition and classification, general principles of natural immunity, phagocytosis, acquired immunity (active and passive). b) Antigens – structure, types and properties, antibodies and their formation. c) Antigen-antibody reactions. d) Bacterial exotoxins and endotoxins.	12

	e) Significance of toxoids in active immunity. f) Immunization programme. g) Primary and secondary immunity and importance of booster dose	
VII	Microbial Culture Sensitivity, Assays and Immunological Products: a) Microbial culture sensitivity Testing: Introduction, methods and interpretation of results. E-test and determination of MIC b) Microbiological assays: Principle and methods. Microbiological assay of: antibiotics -penicillin, streptomycin Vitamins-vitamin B₂ and vitamin B₁₂ c) Immunological products & standardization of vaccines and sera: General procedure for manufacturing and standardization of Bacterial and viral vaccines. Standardization of vaccines: DPT, BCG, polio, rabies; Standardization of sera: Anti-tetanus, anti-rabies.	13
VIII	Infectious Diseases and Diagnostic Techniques: a) Study of infectious diseases: malaria, typhoid, tuberculosis, meningitis, syphilis, cholera, hepatitis, HIV and corona virus. b) Study of Molecular Diagnostic Techniques: southern blotting, western blotting and northern blotting. c) Diagnostic Molecular Biology: conventional diagnostic tests: Schick's, widal, QBC, mantoux and peripheral smear. Molecular diagnostic techniques: PCR, qPCR, RT-PCR and Multiplex PCR. Immunological diagnostic tests: ELISA, LFIA, RADTs	13

Text Books (Latest Edition)

1. Kokare, Chandrakant. A Text Book of Pharmaceutical Microbiology. Nirali Prakashan, Pune,
2. Pelczar, M. J., Reid, R. D., and Chan, E. C. S. Microbiology. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Tortora, G. J., Funke, B. R., Case, C. L., Bair, W. B., and Weber, D. Microbiology: An Introduction. Pearson: Hoboken, NJ.
4. Mary Louis Turgeon — Immunology and Serology in Laboratory Medicines Mosby-Year book inc St. Louis: Missouri.
5. Ananthanarayan, R., Paniker, C. K. J., Kanungo, R., and Saxena, S. Ananthanarayan and Paniker's Textbook of Microbiology. Universities Press (India) Pvt. Ltd.: Hyderabad,

Reference Books (Latest Edition)

1. Gilmore, B. F., & Denyer, S. P. (Eds.). Hugo and Russell's Pharmaceutical Microbiology). Wiley India Pvt. Ltd.: New Delhi.
2. Prescott L.M., Jarley G.P Klein D.A —Microbiology. Mc Graw Hill Company Inc: Boston.
3. Rawlins E.A. Bentley's Text Book of Pharmaceutics. Bailliere Tindals: London.
4. Forbisher - Fundamentals of Microbiology. W.B. Saunders: Philadelphia.
5. War Roitt, Jonathan Brostoff, David male- Immunology, Mosby-year book Europe Ltd: London.
6. Indian Pharmacopoeia. Indian Pharmacopoeia Commission. Ghaziabad.

2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)

Teaching Scheme

Theory: 03 Hrs / Week

Examination Scheme:

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100 Marks

Scope: Pharmacognosy involves the study of crude drugs derived from natural sources, including plants, animals, and minerals, encompassing their identification, cultivation, processing, and evaluation. It provides the foundation for understanding medicinal plants, natural products, and their applications in pharmaceutical sciences.

Course Objectives

- To explain the history, scope, classification, identification, cultivation, and pharmacognostic significance of crude drugs.
- To apply pharmacognostic principles for the morphological, microscopical, powder microscopical, collection, processing, and storage evaluation of crude drugs.
- To analyze the sources, classification, chemistry, evaluation, and pharmaceutical importance of natural pesticides, carbohydrates, lipids, proteins, and plant fibres.
- To evaluate crude drugs for quality, authenticity, and adulteration using appropriate pharmacognostic and analytical methods.

Course Outcomes: Upon successful completion of the course, the student shall be able to

CO 1. Explain the definition, history, scope, and importance of Pharmacognosy.

CO 2. Classify crude drugs using different classification systems and identify them through microscopical and powder microscopical studies.

CO 3. Apply appropriate principles for the cultivation, collection, processing, and storage of crude drugs.

CO 4. Identify and analyze the structure and functions of cell-wall constituents, cell inclusions, and other plant cell constituents.

CO 5. Classify and analyze natural pesticides based on their sources, characteristics, and pharmaceutical applications.

CO 6. Analyze the chemistry, classification, sources, and pharmacognostic characteristics of carbohydrate-containing crude drugs.

CO 7. Apply and analyze extraction, chemistry, analysis, and medicinal importance of lipids and fixed oils from natural sources.

CO 8. Analyze the chemistry and analysis of proteins, identify plant fibres used in surgical dressings, and evaluate common methods of adulteration of crude drugs.

COURSE CONTENT

Unit	Topics	Duration (Hrs)
1.	a) Introduction, definition, history and scope of pharmacognosy. b) Classification of crude drugs. c) Microscopical and powder microscopical study of crude drugs.	12
2.	a) Cultivation, collection, processing and storage of crude drugs. b) Detailed method of cultivation of crude drugs.	10
3.	a) Study of cell wall constituents and cell inclusions. b) Detailed study of various cell constituents.	10
4.	a) Study of natural pesticides. b) Definition, classification, chemistry and method of analysis of protein.	10
5.	a) Introduction to alkaloids containing drugs: Datura, Nux Vomica, Ephedra, Rauwolfia, Quassia. b) Introduction to glycosides containing drugs: Senna, Liquorice	10
6.	a) Carbohydrates (Definition, History, Occurrence, Classification, Isolation, Physical and Chemical properties, Identification tests, and Pharmaceutical Applications and related products. (Whole grains, Pseudo Cereals, Starchy vegetables). b) Detailed study of carbohydrates containing drugs.(Acacia, Agar, Bael, Guar gum, Honey, Inulin, Isapgol, Karaya gum, Pectin, Starch, Tragacanth)	13
7.	a) Definition, sources, method of extraction, chemistry and method of analysis of lipids. b) Detailed study of oils. (Arachis oil, Castor oil, Cod liver oil, Olive oil Sesame oil, Shark liver oil).	13
8.	a) Study of the plants fibers used in surgical dressings and related products. b) Different methods of adulteration of crude drugs.	12

Text Books (Latest Edition):

1. Pharmacognosy by G.E. Trease & W.C.Evans.
2. Textbook of Pharmacognosy and Phytochemistry by Biren Shah and A.K. Seth.
3. Pharmacognosy by C.K.Kokate, Gokhale & A.C.Purohit.

Reference Books (Latest Edition):

1. Pharmacognosy by Brady & Tyler.E.
2. Pharmacognosy by T.E.Wallis.
3. Pharmacognosy by C.S. Shah & Qadery.
4. Pharmacognosy by M.A. Iyengar.

2.4 PHARMACOLOGY-I (THEORY)

Teaching Scheme:

Lectures: 03 Hr/Week

Tutorials: 01 Hr/Week

Examination Scheme:

Internal Exam: 30 Marks

External Exam: 70 Marks

Total: 100 Marks

Scope: This course provides knowledge of drug classification, pharmacokinetics, pharmacodynamics, therapeutic uses, adverse effects and drug interactions with emphasis on drugs acting on the autonomic and central nervous systems, cardiovascular system, renal system, respiratory system and autacoids.

Course Objectives

- To interpret fundamental principles of pharmacology and drug action.
- To analyse pharmacological properties, mechanisms, therapeutic uses, and adverse effects of drugs.
- To correlate drug actions with their therapeutic applications in clinical conditions.
- To apply pharmacological knowledge for rational and safe use of medicines.

Course Outcomes: Upon successful completion of the course, the student shall be able to

- CO 1.** Interpret the fundamental principles of pharmacology, pharmacokinetics, pharmacodynamics, and receptor mechanisms.
- CO 2.** Analyze factors modifying drug effects, toxicity, preclinical evaluation and drug interactions.
- CO 3.** Correlate neurohumoral transmission with the actions and therapeutic applications of drugs acting on autonomous nervous system.
- CO 4.** Analyze the mechanisms, therapeutic applications and adverse effects of CNS drugs.
- CO 5.** Evaluate the pharmacological properties and therapeutic applications of drugs used in psychotic, manic, Parkinson's and Alzheimer's diseases.
- CO 6.** Develop the knowledge of drugs acting on blood, blood forming agents and on renal system in therapeutics
- CO 7.** Apply pharmacological principles to the management of major cardiovascular disorders.
- CO 8.** Correlate the actions of respiratory drugs and autacoids with their therapeutic applications.

COURSE CONTENT

UNIT	DETAILS	HOURS
I	General Pharmacology- I a) Introduction, definitions and scope of pharmacology b) Routes of administration of drugs c) Pharmacokinetics (absorption, distribution, metabolism and excretion) d) Pharmacodynamics e) Drug Receptors – Ligand gated ion channels, G protein-coupled receptors, Enzyme linked receptors and nuclear receptors	09
II	General Pharmacology- II a) Factors modifying drug action b) Drug toxicity – acute, sub-acute and chronic toxicity. c) Preclinical evaluations d) Drug interactions <i>Note: The term Pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, pharmacodynamics, adverse effects, contraindications, Therapeutic uses, interactions and dose and route of administration.</i>	09
III	Pharmacology of drugs acting on Autonomic Nervous System a) Neurohumoral transmission in ANS and neurotransmitters in ANS b) Adrenergic and antiadrenergic drugs c) Cholinergic and anticholinergic drugs d) Neuromuscular blockers e) Mydriatics and miotics f) Drugs used in myasthenia gravis	12
IV	Pharmacology of drugs acting on Central Nervous System –I a) Neurohumoral transmission in CNS and neurotransmitters in CNS b) Alcohol, methyl alcohol and Disulfiram c) General anesthetics and preanesthetic medication d) Pharmacology of Local anesthetics e) Sedatives and hypnotics f) Anticonvulsants g) Analgesics and anti-inflammatory agents	12
V	Pharmacology of drugs acting on Central Nervous System –II a) Psychopharmacological agents: • Antipsychotics • Antidepressants • Anxiolytics • Drugs used in mania and bipolar disorders • Psychotropics and hallucinogens b) CNS stimulants and cognition enhancers c) Drugs used in Parkinsonism d) Drugs used in Alzheimer's disease.	12

VI	Pharmacology of Drugs Acting on Blood and Blood Forming Agents a) Anticoagulants b) Thrombolytics and antiplatelet agents c) Haemopoietics and plasma expanders Pharmacology of Drugs Acting on Renal System a) Diuretics b) Antidiuretics	12
VII	Pharmacology of Drugs Acting on Cardiovascular System a) Antianginal drugs b) Antiarrhythmic drugs c) Drugs used for therapy of congestive heart failure d) Drugs used for hyperlipidemias	12
VIII	Pharmacology of Drugs acting on Respiratory tract and Autacoids I) Drugs acting on respiratory tract a) Bronchodilators b) Mucolytics c) Expectorants d) Antitussives e) Nasal Decongestants II) Pharmacology of autacoids and their antagonists a) Histamines and Antihistaminics b) 5-Hydroxytryptamine and its antagonists c) Lipid derived autacoids and platelet activating factor	12

Text Books (Latest Edition)

1. Tripathi KD. Essentials of Medical Pharmacology. Jaypee Brothers Medical Publishers.
2. Satoskar RS, Bhandarkar SD, Rege NN. Pharmacology and Pharmacotherapeutics. Popular Prakashan.
3. Rang HP, Dale MM, Ritter JM, Flower RJ, Henderson G. Rang and Dale's Pharmacology, Elsevier.
4. Sharma HL, Sharma KK. Principles of Pharmacology. Paras Medical Publisher
5. Barar FSK. Essentials of Pharmacotherapeutics, S Chand and Company Ltd.

2.5 COMMUNITY PHARMACY

(THEORY 60 HOURS)

Teaching Scheme

Lectures: 02 Hr/Week

Examination Scheme:

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100 Marks

Scope: The subject provides an understanding of contemporary community pharmacy practice, focusing on patient-centered care, medication management, counselling, health screening, minor ailment management, and rational drug use to improve public health and therapeutic outcomes.

Course Objectives

- To understand the principles of community pharmacy practice, including pharmaceutical care services and professional pharmacy management.
- To apply patient counselling, health screening, and communication skills to provide effective, patient-centered care.
- To assess minor ailments and recommend appropriate over-the-counter (OTC) medications while promoting the rational use of medicines.
- To develop the ability to optimize drug therapy and deliver compassionate, high-quality pharmaceutical care to improve patient outcomes.

Course Outcomes: Upon completion of this course, the student shall be able to

- CO 1.** Explain the scope, roles, and responsibilities of community pharmacists in providing patient-centered pharmaceutical care.
- CO 2.** Apply principles of community pharmacy management, legal requirements, and inventory control for efficient pharmacy operations.
- CO 3.** Interpret prescriptions, identify medication-related problems, and implement the principles of pharmaceutical care to ensure safe medication use.
- CO 4.** Demonstrate effective patient counselling and communication skills to improve medication adherence and therapeutic outcomes.
- CO 5.** Perform basic health screening services and recommend appropriate OTC medications for common health conditions.
- CO 6.** Promote health education, disease prevention, and healthy lifestyle practices through community-based pharmaceutical services.
- CO 7.** Assess common minor ailments and provide evidence-based recommendations for their appropriate management and referral when necessary.
- CO 8.** Apply the principles of rational drug therapy and professional ethics to deliver safe, ethical, and patient-centered community pharmacy practice.

COURSE CONTENTS

Unit	Topics	Duration (Hrs)
I	Introduction to community pharmacy practice Definition, scope of community pharmacy, roles and responsibilities of community pharmacist.	04
II	Community pharmacy management & inventory control a) Selection of site, space layout, and design b) Staff, materials- coding, stocking c) Legal requirements d) Maintenance of various registers e) Use of computers: business & healthcare software's f) Inventory control-definition, various methods of inventory control ABC, VED, EOQ, lead time, safety stock, FSN analysis	10
III	Prescription handling and pharmaceutical care a) Prescription -prescription processing, prescription-related medication problems, drug interactions b) Definition & principles of pharmaceutical care	06
IV	a) Patient counselling Definition, outcomes, various stages, barriers, strategies to overcome barriers, patient information leaflets- content, design and layouts, advisor labels b) Patient medication adherence Definition, factors affecting medication adherence, role of pharmacist in improving the adherence.	08
V	Health screening, OTC medication a) Definition, importance, methods for screening-blood pressure, blood sugar, lung function and cholesterol testing, BMI assessment. b) WHO definition of health, and health promotion, care for children, pregnant and breast feeding women, and geriatric patients. c) OTC medications, counselling, prescription vs OTC medicines, dispensing rules & schedule for OTC medication.	08
VI	Health education a) Commonly occurring communicable diseases, causative agents, clinical presentations and prevention of communicable diseases - tuberculosis, hepatitis, typhoid, amoebiasis, malaria, leprosy, syphilis, gonorrhea and AIDS b) Balance diet, and treatment and prevention of deficiency disorders family planning - role of pharmacist, hygiene and sanitation practices.	10
VII	Minor ailment management Management of common minor ailments (nausea, vomiting, dyspepsia, diarrhea, constipation, pyrexia, ophthalmic symptoms, worms infestations). Basic interpretation of skin allergies and rashes.	08

VIII	Rational drug therapy and professional ethics Essential drugs concept and rational drug therapy, role of a community pharmacist. code of ethics for community pharmacists.	06

Text Books (Latest Edition)

1. Health Education and Community Pharmacy by N.S. Parmar.
2. WHO consultative group report.
3. Drug store & Business management by Mohammed Ali & Jyoti.

Reference books (Latest Edition)

1. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
2. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams &Wilkins.
3. Physicians' Desk Reference (PDR).
4. World Health Organization. WHO Expert Committee Reports and Technical Reports on Public Health and Medicines. World Health Organization.

2.6 PHARMACOTHERAPEUTICS – I

(THEORY – 90 HOURS)

Teaching Scheme**Lectures:** 03 Hours/Week**Tutorials:** 01 Hour/Week**Examination Scheme****Internal Exam:** 30 Marks**External Exam:** 70 Marks**Total Marks:** 100

Scope: This course covers disease pathophysiology and evidence-based pharmacotherapy, emphasizing rational prescribing and individualized care. It develops clinical decision-making, medication safety, and patient-centered pharmaceutical care.

Course Objectives:

- To understand the pathophysiology of diseases affecting major organ systems.
- To explain the principles of evidence-based pharmacotherapy and rational drug use.
- To apply current treatment guidelines for the management of common acute and chronic diseases.
- To develop patient-centered therapeutic plans considering efficacy, safety, monitoring, drug interactions, adverse effects, and special patient populations.

Course Outcomes: Upon successful completion of this course, the student shall be able to

- CO 1.** Describe the pathophysiology of diseases involving respiratory, endocrine, cardiovascular and ophthalmic systems.
- CO 2.** Explain the pharmacological basis of drug therapy using current clinical guidelines.
- CO 3.** Apply evidence-based pharmacotherapeutic principles in disease management.
- CO 4.** Analyze patient-specific clinical parameters to optimize medication therapy.
- CO 5.** Evaluate drug efficacy, safety, contraindications, adverse drug reactions and drug interactions.
- CO 6.** Design individualized pharmacotherapeutic plans for patients with multiple comorbidities.
- CO 7.** Recommend appropriate monitoring parameters and therapeutic endpoints for disease management.
- CO 8.** Demonstrate the role of the clinical pharmacist in promoting rational drug use, medication safety, patient counseling and therapeutic outcome assessment.

COURSE CONTENTS

Unit	Topics	Duration (Hrs)
I	Etiopathogenesis and Pharmacotherapy of Diseases Associated with Cardiovascular System a) Electrophysiology of heart b) Hypertension, hypertensive emergencies, hypertensive urgency c) Arrhythmias d) Congestive cardiac failure (CCF) e) Application of ACC/AHA, ISH and ESH guidelines	13
II	Etiopathogenesis and Pharmacotherapy of Diseases Associated with Cardiovascular System a) Dyslipidemias b) Stable angina pectoris c) Myocardial infarction	13
III	Etiopathogenesis and Pharmacotherapy of Diseases Associated with Respiratory System a) Introduction to pulmonary function tests (PFTs) b) Bronchial Asthma c) Chronic obstructive pulmonary disease (COPD) d) Drug induced pulmonary disorders e) Application of GINA and GOLD guidelines in clinical practice	13
IV	Etiopathogenesis and Pharmacotherapy of Diseases Associated with Endocrine System – Part I a) Diabetes mellitus (Type 1 & Type 2) b) Thyroid disorders (hypothyroidism and hyperthyroidism) c) Osteoporosis	10
V	Etiopathogenesis and Pharmacotherapy of Diseases Associated with Musculoskeletal System a. Rheumatoid arthritis b. Osteoarthritis c. Gout d. Spondylitis e. Systemic lupus erythematosus.	9
VI	Etiopathogenesis and Pharmacotherapy of Diseases associated with Renal System a. Acute renal failure b. Chronic renal failure c. Renal dialysis d. Drug induced renal disorders	13
VII	Etiopathogenesis and Pharmacotherapy of Diseases Associated with Ophthalmology a) Glaucoma b) Viral and bacterial conjunctivitis c) Xerophthalmia	9

VIII	Introduction to Rational Drug Use: a) Definition, principles of rational drug therapy b) Role of pharmacist in essential drug concept c) Rational drug formulation	10
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Text Books (Latest Edition)

1. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.
2. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.

Reference Books (Latest Edition)

1. Pathologic basis of disease - Robins SL, W.B.Saunders publication.
2. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
3. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
4. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
5. Goodman & Gilman's Manual of Pharmacology and Therapeutics. McGraw Hill.
6. Braunwald's Heart Disease: A text book of Cardiovascular Medicine.

2.6: PHARMACOTHERAPEUTICS – I (PRACTICAL- 90 HOURS)

Teaching Scheme

Practical: 03Hours/ Week

Examination Scheme

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100

Scope: The practical component integrates classroom knowledge with hospital-based experiential learning in pharmaceutical care and clinical decision-making. Students develop skills in medication management, patient counseling, and evidence-based practice through ward postings.

Course Objectives

- To collect and analyze comprehensive patient information and identify medication-related problems.
- To evaluate pharmacotherapy using evidence-based principles and develop individualized pharmaceutical care plans.
- To apply patient counseling and medication education techniques to optimize therapeutic outcomes.
- To document and communicate clinical interventions professionally and accurately.

Course Outcomes: Upon successful completion of this course, the student shall be able to

CO 1. Obtain complete medication and medical history.

CO 2. Assess patient cases using SOAP and FARM documentation.

CO 3. Identify drug therapy problems and recommend evidence-based interventions.

CO 4. Interpret laboratory reports and clinical investigations.

CO 5. Demonstrate effective patient counseling and discharge medication education.

CO 6. Evaluate therapeutic outcomes and identify adverse drug reactions.

CO 7. Communicate effectively with physicians and healthcare professionals.

CO 8. Prepare and maintain professional clinical documentation according to accepted standards.

Practical:

Hospital postings for a period of at least 50 hours is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards.

Each student shall maintain a **Clinical Case Record Book (Logbook)** documenting all assigned cases, clinical interventions, and learning activities. The completed logbook, duly certified by the clinical preceptor and faculty coordinator, shall be submitted for evaluation at the end of the

Assignments

Students shall prepare **three (03) evidence-based written assignments**, each comprising **1,500–2,000 words**, on topics assigned by the course coordinator. The assignments shall focus on recent advances, current clinical practice guidelines, emerging therapies, medication safety, pharmacoeconomics, or contemporary issues in pharmacotherapeutics.

Format of the assignment:

1. Each assignment shall contain **1,500–2,000 words** (excluding references).
2. A minimum of **10 recent peer-reviewed references** shall be cited using the **Vancouver referencing style**.
3. References should preferably include current editions of standard textbooks, systematic reviews, meta-analyses, national/international clinical practice guidelines (e.g., ADA, ACC/AHA, ESC, ISH ESH, GOLD, GINA, KDIGO, NICE), and indexed journal articles published within the last five years wherever applicable.
4. Assignments shall be prepared in a professionally formatted computer-generated document using the departmental template.
5. Each assignment shall include a title page, certificate page, plagiarism declaration, table of contents (where applicable), main text, references, and appendices (if required).
6. The student's name, roll number, class, department, signature, and guide's signature shall be included on the certificate page.
7. Students shall submit both **hard copy and soft copy** of each assignment within the prescribed timeline.
8. Each student shall deliver an oral presentation of the assignment at the end of the academic year, followed by discussion and questioning.

Practice based learning activities:

Activity	Minimum Number
Complete Case Presentations	20
SOAP Notes	20
Patient Counseling Sessions	15
ADR Reports	5
Medication Error Reports	3
Drug Information Responses	5
Prescription Audits	10
Clinical Interventions	5
Medication Reconciliation	5
Journal Club	2
Seminar	1

Scheme of Practical Examination

Sessionals		Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note: Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

Recommended Books: (Latest Edition)

1. DiPiro JT, Yee GC, Posey LM, Haines ST, Nolin TD, Ellingrod V, Pharmacotherapy: A Pathophysiologic Approach. McGraw Hill.
2. British National Formulary (BNF). Pharmaceutical Press.
3. Drug Information Handbook. Lexicomp.
4. Stockley's Drug Interactions. Pharmaceutical Press.
5. Martindale: The Complete Drug Reference. Pharmaceutical Press.

Reference Books (Latest Edition)

1. Brunton LL, Hilal-Dandan R, Knollmann BC, Goodman and Gilman's The Pharmacological Basis of Therapeutics. McGraw-Hill Education.
2. Katzung BG, Trevor AJ. Basic and Clinical Pharmacology, McGraw-Hill Education;
3. Craig CR, Stitzel RE. Modern Pharmacology with Clinical Applications, Lippincott Williams and Wilkins.
4. Shargel L, Yu ABC. Applied Biopharmaceutics and Pharmacokinetics, McGraw-Hill Education
5. Walker R, Whittlesea C, et al. Clinical Pharmacy and Therapeutics, Elsevier.
6. Braunwald's Heart Disease: A text book of Cardiovascular Medicine.

2.7: PHARMACEUTICAL MICROBIOLOGY (PRACTICAL 90 HOURS)

Teaching Scheme

Practicals: 03 Hr / Week

Examination Scheme:

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100 Marks

Scope: Pharmaceutical Microbiology covers microorganisms, infection control, sterilization, disease diagnosis, antimicrobial therapy, and quality assurance for pharmaceutical and clinical practice.

Course Objectives

- To develop proficiency in microbiological laboratory techniques, including: aseptic practices, sterilization, media preparation, staining and isolation of microorganisms.
- To acquire practical skills in the identification, enumeration and biochemical characterization of microorganisms using standard microbiological methods.
- To perform microbiological quality control tests, including culture sensitivity testing, sterility testing, minimum inhibitory concentration (MIC) and microbiological assays of pharmaceuticals.
- To apply microbiological and diagnostic techniques for the laboratory diagnosis of infectious diseases and the evaluation of pharmaceutical products.

Course Outcomes: Upon successful completion of the course, the student should be able to

- CO 1.** Identify and use microbiology laboratory equipments and follow appropriate laboratory safety practices.
- CO 2.** Apply basic microbiological techniques to isolate, identify, enumerate, characterize and preserve medically important microorganisms.
- CO 3.** Apply principles of sterilization, disinfection, sterility testing and pasteurization.
- CO 4.** Evaluate the efficacy of disinfectants and preservatives using standard methods.
- CO 5.** Interpret the principles and applications of conventional, molecular and immunological diagnostic techniques for infectious diseases.
- CO 6.** Perform and interpret antimicrobial susceptibility testing, microbiological assays and standardization of biological products.
- CO 7.** Perform standard laboratory tests for diagnosing common infectious diseases.
- CO 8.** Apply microbiological principles to ensure the quality, safety and rational use of pharmaceutical products in clinical and pharmaceutical practice.

Course Content

Expt. No.	Title of the Experiment	Duration (Hrs)
1.	Study of equipments used and the safety rules to be followed in experimental microbiology.*	3
2.	Sterilization of glass ware Preparation of culture media and sterilization.*	6
3.	Staining techniques – simple staining; gram staining; negative staining.**	9
4.	Study of motility characters - by hanging drop method.*	6
5.	Enumeration of micro-organisms (total and viable).*	6
6.	Study of the methods for isolation of pure cultures.*	6
7.	Biochemical testing for the identification of microorganisms. IMVIC Tests, starch and gelatin hydrolysis tests	6
8.	Culture sensitivity testing of some microorganisms.*	6
9.	Sterility testing of powders and liquids.*	6
10.	Determination of minimum inhibitory concentration of an antibiotic.*	3
11.	Microbiological assay of antibiotics by cup plate method.*	6
12.	Microbiological assay of vitamins by turbidometric method.**	6
13.	Determination of RWC.**	3
14.	Diagnostic tests for some common diseases, widal and malarial parasite.**	6
15.	Isolation and identification of bacteria, molds and yeasts	6
16.	Visit to milk dairies (pasteurization) and microbiological laboratories (other sterilization methods) and study of activities and equipments / instruments used and reporting the same. *	6

Note

*Indicate minor experiment

** Indicate major experiment

Assignments

1. Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.
2. Library assignments
 - a) Report of recent microbial techniques developed in diagnosing some common diseases.
 - b) Latest advancements developed in identifying, cultivating & handling of microorganisms.

Format of the assignment

1. Minimum & maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.

4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 min.

Scheme of Practical Examination

	Internal/ Sessional	External
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max. marks	20	70
Duration	3 hours	4 hours

Note: Total sessional marks - 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

Text Books (Latest Edition)

1. Chandrakanth Kokare. Pharmaceutical Microbiology: Experiments and Techniques. Pharma Career Publications. Nashik
2. Bhusari, Kishore P., and Vinita V. Kale. Practical Microbiology: Principles & Techniques. Himalaya Publishing House, Mumbai.
3. Prasad, G. Shyam and K. Srisailam. Pharmaceutical Microbiology: A Laboratory Manual. PharmaMed Press / BSP Books, Hyderabad.
4. Indian Pharmacopoeia Commission. Indian Pharmacopoeia. Latest edition, Indian Pharmacopoeia Commission, Ghaziabad.

Recommended Books (Latest Edition)

1. Aneja, K. R. Experiments in Microbiology, Plant Pathology and Biotechnology. New Age International Publishers, New Delhi
2. Jain A., Agarwal J., and Venkatesh V. Microbiology Practical Manual. Elsevier India.

2.8 PHARMACOGNOSY&PHYTOPHARMACEUTICALS (PRACTICAL)

Teaching Scheme

Practical: 03 Hrs / Week

Examination Scheme:

Internal Exam: 30 Marks

External Exam: 70 Marks

Total Marks: 100 Marks

Scope: The pharmacognosy laboratory provides practical training in the identification, evaluation, microscopy, and chemical analysis of crude drugs and natural products. It enables students to develop hands-on skills in quality assessment and standardization of medicinal plant materials and pharmaceutical products.

Course Objectives:

- To apply macroscopic, microscopic, and powder microscopic techniques for the identification and authentication of crude drugs.
- To perform physicochemical evaluation and analytical tests for natural products, including lipids and carbohydrate-containing crude drugs.
- To analyze the microscopic and diagnostic characteristics of medicinal plant materials and differentiate authentic crude drugs from related samples.
- To evaluate crude drugs and natural substances through chemical tests, physicochemical parameters, interpretation of experimental observations, and quality assessment.

Course Outcomes: Upon successful completion of the course, the student shall be able to

- CO 1.** Demonstrate laboratory safety practices and identify plant cell-wall constituents and cell inclusions using microscopic techniques.
- CO 2.** Identify crude drugs based on their macroscopic, microscopic, and powder microscopic characteristics.
- CO 3.** Perform and analyze microscopic evaluation of medicinal plant materials to differentiate authentic crude drugs from related samples.
- CO 4.** Determine and calculate physicochemical constants of lipids, including iodine value, saponification value, ester value, acid value, and unsaponifiable matter.
- CO 5.** Perform and interpret chemical identification tests for carbohydrate-containing crude drugs such as Acacia, Tragacanth, Agar, and Starch.
- CO 6.** Analyze different lipid samples, including castor oil, sesame oil, shark liver oil, and beeswax, using appropriate chemical tests.
- CO 7.** Evaluate protein-based natural products such as gelatin using standard chemical tests.
- CO 8.** Interpret experimental observations and prepare laboratory records for the identification, evaluation, and quality assessment of crude drugs and natural products.

COURSE CONTENT

Unit	Topics	Duration (Hrs)
1.	Introduction of pharmacognosy laboratory and experiments	03
2.	Study of cell wall constituents and cell inclusions.	03
3.	Macro, powder and microscopic study of Datura.	03
4.	Macro, powder and microscopic study of Senna.	03
5.	Macro, powder and microscopic study of Cassia.cinnamon.	03
6.	Macro, powder and microscopic study of Cinchona.	03
7.	Macro, powder and microscopic study of Ephedra.	03
8.	Macro, powder and microscopic study of Quassia.	03
9.	Macro, powder and microscopic study of Clove	03
10.	Macro, powder and microscopic study of Fennel.	03
11.	Macro, powder and microscopic study of Coriander.	03
12.	Macro, powder and microscopic study of Isapgol.	03
13.	Macro, powder and microscopic study of Nux vomica.	03
14.	Macro, powder and microscopic study of Rauwolfia.	03
15.	Macro, powder and microscopic study of Liquorice.	03
16.	Macro, powder and microscopic study of Ginger.	03
17.	Macro, powder and microscopic study of Podophyllum.	03
18.	Determination of Iodine value.	03
19.	Determination of Saponification value and unsaponifiable matter.	03
20.	Determination of ester value.	03
21.	Determination of Acid value.	03
22.	Chemical tests for Acacia.	03
23.	Chemical tests for Tragacanth.	03
24.	Chemical tests for Agar.	03
25.	Chemical tests for Starch.	03
26.	Chemical tests for Lipids - castor oil.	03
27.	Chemical tests for Lipids - sesame oil	03
28.	Chemical tests for Lipids - shark liver oil	03
29.	Chemical tests for Lipids - bees wax	03
30.	Chemical tests for Gelatin.	03

Scheme of Practical Examination:

	Sessional	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15

Max Marks	20	70
Duration	03hrs	04hrs

Note

Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voice and record maintenance).

Recommended Books:

1. Practical Pharmacognosy — K. R. Khandelwal
2. Practical Pharmacognosy — C. K. Kokate, A. P. Purohit and S. B. Gokhale
3. Textbook of Pharmacognosy — C. K. Kokate, A. P. Purohit and S. B. Gokhale
4. Pharmacognosy — G. E. Trease and W. C. Evans
5. Pharmacognosy and Phytochemistry — V. D. Rangari
6. Practical Pharmacognosy and Phytochemistry — S. H. Ansari
7. Indian Herbal Pharmacopoeia — Indian Drug Manufacturers' Association
8. Indian Pharmacopoeia — Indian Pharmacopoeia Commission