

CHE-362-MJ-T: MEDICINAL CHEMISTRY

Course Type: Major Elective Theory

Credits: 2

A. Course Objectives:

1. To introduce the fundamentals, scope, and importance of medicinal chemistry in drug discovery and development.
2. To understand physicochemical properties and their role in drug action and design.
3. To familiarize students with the chemistry, mode of action, and therapeutic applications of important drugs.
4. To develop knowledge of structure–activity relationship, drug–receptor interactions, and rational drug design.
5. To provide an understanding of pharmaceutical dosage forms and routes of drug administration.
6. To enhance the ability to relate chemical structure with biological activity and therapeutic effects.

B. Course Outcomes (COs):

CO No.	Course Outcome Statement (COs) <i>After learning the course, the students are able to -</i>
CO-1	Recall basic concepts, terminology, and classification of drugs.
CO-2	Explain physicochemical properties and mechanisms of drug action.
CO-3	Apply medicinal chemistry concepts to classify and study therapeutic agents.
CO-4	Analyze structure–activity relationships and drug–receptor interactions.
CO-5	Evaluate the therapeutic importance and pharmaceutical applications of drugs.
CO-6	Design approaches for rational drug development and dosage formulation.

C. Contents:

Prerequisites	
Students should have basic knowledge of organic chemistry, biochemistry, and human physiology. Familiarity with functional groups, stereochemistry, chemical bonding, and basic pharmacological terms is desirable.	
Chapter 1: Introduction to Medicinal Chemistry	06 Hours
Introduction, History and Development of Medicinal Chemistry, Definition, Scope, drug targets, Drug discovery, design and development, Sources of drugs (natural, synthetic), Classification of drugs (therapeutic/structural), Drugs and the medicinal chemist, Introduction	

to drug action, Physicochemical properties in relation to biological action.

(Ref.1 Pages 9-23, Ref.2 Pages 11-26, Ref.3 Pages 37-55)

Chapter 2: Bio-Physicochemical Properties in Drug Action and Design**08 Hours**

Introduction, Acidity/Basicity, Solubility, Ionization, Hydrophobic and hydrophilic properties, Lipinski Rule, Terminology in Medicinal Chemistry: Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, antimetabolites and therapeutic index. Importance of stereochemistry in drug action (Example: Ibuprofen), Concept of rational drug design: Structure activity relationship, Drug-receptor interactions and Clinical trials.

(Ref.3 Pages 57-75, 95-96, Ref.8 Pages 153, 189-274, 384-392, Ref. 7 Pages 29-61)

Chapter 3: Drugs for Infectious Diseases**09 Hours**

Introduction, Structures, Example, Mode of Action and Applications:

- A. Anti-Cancer Agents** (e.g. Cis Platin, 6-Mercaptopurine)
- B. Anti-Viral Agents** (e.g. Valaciclovir, Desciclovir)
- C. Proton pump inhibitors** (e.g. Omeprazole, Lansoprazole)
- D. Anti-inflammatory and Analgesic Agents:** (e.g. Aspirin, Paracetamol)
- E. Antibacterial drugs-** (e.g. Sulfonamides: Sulfadiazine, sulfanilamide)
- F. Antibiotics:** (e.g., Penicillins, Cephalosporins)

(Ref.2 166-187), (Ref. 4 page 581-608, (Ref.5 Page 191-228), (Ref. 6 Page 265-291, Ref. 7 page 7, 78-109, 421, 514, Ref.8 468-473, 659-,680-685), Ref.9 Page 144-154)

Chapter-4: Pharmaceutical aspects**07 Hours**

1] Routes of drug administration, Pharmaceutical Phase

2] Formulation of dosage forms, types of dosage forms

a) Solid (granules, tablets, capsule and powder),

b) Semisolid (gel, ointments)

c) Liquid (solutions, syrups),

d) Sterile (parenteral/ injectable),

e) Gaseous (spray, inhaler)

f) Biological (vaccines): Immunobiologicals

(Ref Page 3 Page 46-47, Ref 5 Page 3-1, Ref 5 156-177, Ref 10 Page 380-626)

References:

1. A Textbook of Medicinal Chemistry, K. G. Bothara, Nirali Prakashan, 2019.
2. An Introduction to Medicinal Chemistry, Graham L. Patrick, Oxford University Press,

Oxford/New York/Tokyo, 1995.

3. Fundamentals of Medicinal Chemistry, Gareth Thomas, John Wiley & Sons, 2003.
4. Medicinal Chemistry, Ashutosh Kar, New Age International (P) Limited, 4th Edition, 2007.
5. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale Jr., John H. Block, Lippincott Williams & Wilkins, 12th Edition, 2011.
6. Textbook of Medicinal Chemistry, Volume II, V. Alagarsamy, Elsevier, 2010.
7. Foye's Principles of Medicinal Chemistry, Thomas L. Lemke, David A. Williams, Victoria F. Roche, S. William Zito, Wolters Kluwer (Lippincott Williams & Wilkins), 7th Edition, 2013.
8. An Introduction to Medicinal Chemistry, Graham L. Patrick, Oxford University Press, 5th Edition, 2013.
9. Introduction to Medicinal Chemistry, Alex Gringauz, Wiley-VCH, 1996.
10. Aulton's Pharmaceutics: The Design and Manufacture of Medicines, Michael E. Aulton, Kevin M. G. Taylor, Elsevier Ltd., 5th Edition, 2018.